ray's School and Field Botany

REVISED LESSONS

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GRAY'S

SCHOOL AND FIELD BOOK

OF

BOTANY.

CONSISTING OF

"LESSONS IN BOTANY," AND "FIELD, FOREST, AND GARDEN BOTANY,"

BOUND IN ONE VOLUME.

By ASA GRAY,

FISHER PROFESSOR OF NATURAL HISTORY IN HARVARD UNIVERSITY.

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PUBLISHERS' PREFACE

TO

GRAY'S SCHOOL AND FIELD BOOK OF BOTANY.

THIS work consists of the "LESSONS IN BOTANY" and the "FIELD, FOREST AND GARDEN BOTANY," bound together in *one complete volume*, forming a most popular and comprehensive SCHOOL BOTANY, adapted to beginners and advanced classes, to Agricultural Colleges and Schools, as well as to all other grades in which the science is taught. It is also adapted for use as a hand-book to assist in analyzing plants and flowers in field study of botany, either by classes or individuals.

The book is intended to furnish Botanical Classes and beginners with an easier introduction to the Plants of this country, and a much more comprehensive work, than is the MANUAL.

Beginning with the *first principles*, it progresses by easy stages until the student, who is at all diligent, is enabled to master the intricacies of the science.

It is a *Grammar* and *Dictionary* of Botany, and comprises the common Herbs, Shrubs, and Trees of the Southern as well as the Northern and Middle States, including the commonly cultivated, as well as the native species in *fields*, *gardens*, *pleasure-grounds*, or *house culture*, and even the *conservatory plants* ordinarily met with.

This work supplies a great *desideratum* to the Botanist and Botanical Teacher, there being no similar class-book published in this country.

GRAY'S LESSONS IN BOTANY

REVISED EDITION

THE

ELEMENTS OF BOTANY

FOR BEGINNERS AND FOR SCHOOLS

By ASA GRAY

NEW YORK ·:· CINCINNATI ·:· CHICAGO

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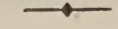
PREFACE.



This volume takes the place of the author's Lessons in Botany and Vegetable Physiology, published over a quarter of a century ago. It is constructed on the same lines, and is a kind of new and much revised edition of that successful work. While in some respects more extended, it is also more concise and terse than its predecessor. This should the better fit it for its purpose now that competent teachers are common. They may in many cases develop paragraphs into lectures, and fully illustrate points which are barely, but it is hoped clearly, stated. Indeed, even for those without a teacher, it may be that a condensed is better than a diffuse exposition.

The book is adapted to the higher schools, "How Plants Grow and Behave" being the "Botany for Young People and Common Schools." It is intended to ground beginners in Structural Botany and the principles of vegetable life, mainly as concerns Flowering or Phanerogamous plants, with which botanical instruction should always begin; also to be a companion and interpreter to the Manuals and Floras by which the student threads his flowery way to a clear knowledge of the surrounding vegetable creation. Such a book, like a grammar, must needs abound in technical words, which thus arrayed may seem formidable; nevertheless, if rightly apprehended, this treatise should teach that the study of botany is not the learning of names and terms, but the acquisition of knowledge and ideas. No effort should be made to commit technical terms to memory. Any term used in describing a plant or explaining its structure can be looked up when it is wanted, and that should suffice. On the other hand, plans of

structure, types, adaptations, and modifications, once understood, are not readily forgotten; and they give meaning and interest to the technical terms used in explaining them.

In these "Elements" naturally no mention has been made of certain terms and names which recent cryptogamically-minded botanists, with lack of proportion and just perspective, are endeavoring to introduce into phanerogamous botany, and which are not needed nor appropriate, even in more advanced works, for the adequate recognition of the ascertained analogies and homologies.

As this volume will be the grammar and dictionary to more than one or two Manuals, Floras, etc., the particular directions for procedure which were given in the "First Lessons" are now relegated to those works themselves, which in their new editions will provide the requisite explanations. On the other hand, in view of such extended use, the Glossary at the end of this book has been considerably enlarged. It will be found to include not merely the common terms of botanical description but also many which are unusual or obsolete; yet any of them may now and then be encountered. Moreover, no small number of the Latin and Greek words which form the whole or part of the commoner specific names are added to this Glossary, some in an Anglicized, others in their Latin form. This may be helpful to students with small Latin and less Greek, in catching the meaning of a botanical name or term.

The illustrations in this volume are largely increased in number. They are mostly from the hand of Isaac Sprague.

It happens that the title chosen for this book is that of the author's earliest publication, in the year 1836, of which copies are rarely seen; so that no inconvenience is likely to arise from the present use of the name.

ASA GRAY.

CAMBRIDGE, MASSACHUSETTS,
March, 1887.

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ELEMENTS OF BOTANY.

Section I. INTRODUCTORY.

1. Botany is the name of the science of the vegetable kingdom in general; that is, of plants.

2. Plants may be studied as to their kinds and relationships. This study is Systematic Botany. An enumeration of the kinds of vegetables, as far as known, classified according to their various degrees of resemblance or difference, constitutes a general *System of plants*. A similar account of the vegetables of any particular country or district is called a *Flora*.

3. Plants may be studied as to their structure and parts. This is Structural Botany, or Organography. The study of the organs or parts of plants in regard to the different forms and different uses which the same kind of organ may assume, — the comparison, for instance, of a flower-leaf or a bud-scale with a common leaf, — is Vegetable Morphology, or Morphological Botany. The study of the minute structure of the parts, to learn by the microscope what they themselves are formed of, is Vegetable Anatomy, or Histology; in other words, it is Microscopical Structural Botany. The study of the actions of plants or of their parts, of the ways in which a plant lives, grows, and acts, is the province of Physiological Botany, or Vegetable Physiology.

4. This book is to teach the outlines of Structural Botany and of the simpler parts of the physiology of plants, that it may be known how plants are constructed and adapted to their surroundings, and how they live, move, propagate, and have their being in an existence no less real, although more simple, than that of the animal creation which they support. Particularly, this book is to teach the principles of the structure and relationships of plants, the nature and names of their parts and their modifications, and so to prepare for the study of Systematic Botany; in which the learner may ascertain the name and the place in the system of any or all of the ordinary plants within reach, whether wild or cultivated. And in ascertaining the name of any plant, the student, if rightly taught, will come to know all about its general or particular structure, rank, and relationship to other plants.

5 The vegetable kingdom is so vast and various, and the difference is so wide between ordinary trees, shrubs, and herbs on the one hand, and mosses, moulds, and such like on the other, that it is hardly possible to frame an intelligible account of plants as a whole without contradictions or misstatements, or endless and troublesome qualifications. If we say that plants come from seeds, bear flowers, and have roots, stems, and leaves, this is not true of the lower orders. It is best for the beginner, therefore, to treat of the higher orders of plants by themselves, without particular reference to the lower.

6. Let it be understood, accordingly, that there is a higher and a lower series of plants; namely: —

PHANEROGAMOUS PLANTS, which come from seed and bear *flowers*, essentially stamens and pistils, through the co-operation of which seed is produced. For shortness, these are commonly called PHANEROGAMS, or *Phænogams*, or by the equivalent English name of FLOWERING PLANTS.[1]

CRYPTOGAMOUS PLANTS, or CRYPTOGAMS, come from minute bodies, which answer to seeds, but are of much simpler structure, and such plants have not stamens and pistils. Therefore they are called in English FLOWERLESS PLANTS. Such are Ferns, Mosses, Algæ or Seaweeds, Fungi, etc. These sorts have each to be studied separately, for each class or order has a plan of its own.

7. But Phanerogamous, or Flowering, Plants are all constructed on one plan, or *type*. That is, taking almost any ordinary herb, shrub, or tree for a pattern, it will exemplify the whole series: the parts of one plant answer to the parts of any other, with only certain differences in particulars. And the occupation and the delight of the scientific botanist is in tracing out this common plan, in detecting the likenesses under all the diversities, and in noting the meaning of these manifold diversities. So the attentive study of any one plant, from its growth out of the seed to the flowering and fruiting state and the production of seed like to that from which the plant grew, would not only give a correct general idea of the structure, growth, and characteristics of Flowering Plants in general, but also serve as a pattern or standard of comparison. Some plants will serve this purpose of a pattern much better than others. A proper pattern will be one that is perfect in the sense of having all the principal parts of a phanerogamous plant, and simple and regular in having these parts free from complications or disguises. The common Flax-plant may very well serve this purpose. Being an annual, it has the advantage of being easily raised and carried in a short time through its circle of existence, from seedling to fruit and seed.

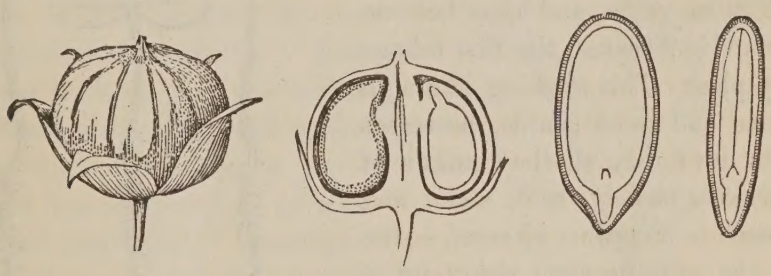
---

[1] The name is sometimes *Phanerogamous*, sometimes *Phænogamous* (*Phanerogams*, or *Phænogams*), terms of the same meaning etymologically; the former of preferable form, but the latter shorter. The meaning of such terms is explained in the Glossary.

SECTION II. FLAX AS A PATTERN PLANT.

8. **Growth from the Seed.** Phanerogamous plants grow from seed, and their flowers are destined to the production of seeds. A seed has a rudimentary plant ready formed in it, — sometimes with the two most essential parts, i. e. stem and leaf, plainly discernible; sometimes with no obvious distinction of organs until germination begins. This incipient plant is called an EMBRYO.

9. In this section the Flax-plant is taken as a specimen, or type, and the development and history of common plants in general is illustrated by it. In flax-seed the embryo nearly fills the coats, but not quite. There is a small deposit of nourishment between the seed-coat and the embryo: this may for the present be left out of the account. This embryo consists of a pair of leaves, pressed together face to face, and attached to an extremely short stem. (Fig. 2–4.) In this rudimentary condition the real nature of the parts is not at once apparent; but when the seed grows they promptly reveal their character, — as the accompanying figures (Fig. 5–7) show.

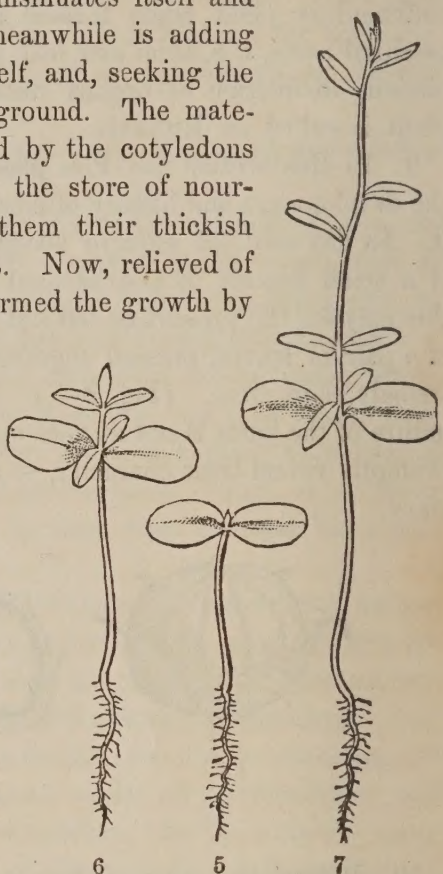


1 2 3 4

10. Before the nature of these parts in the seed was altogether understood, technical names were given to them, which are still in use. These initial leaves were named COTYLEDONS. The initial stem on which they stand was called the RADICLE. That was because it gives rise to the first root; but, as it is really the beginning of the stem, and because it is the stem that produces the root and not the root that produces the stem, it is better to name it the CAULICLE. Recently it has been named *Hypocotyle;* which signifies something below the cotyledons, without pronouncing what its nature is.

FIG. 1. Pod of Flax. 2. Section lengthwise, showing two of the seeds; one whole, the other cut half away, bringing contained embryo into view. 3. Similar section of a flax-seed more magnified and divided flatwise; turned round, so that the stem-end (caulicle) of the embryo is below: the whole broad upper part is the inner face of one of the cotyledons; the minute nick at its base is the plumule. 4. Similar section through a seed turned edgewise, showing the thickness of the cotyledons, and the minute plumule between them, i. e. the minute bud on the upper end of the caulicle.

11. On committing these seeds to moist and warm soil they soon sprout, i. e. *germinate*. The very short stem-part of the embryo is the first to grow. It lengthens, protrudes its root-end; this turns downward, if not already pointing in that direction, and while it is lengthening a root forms at its point and grows downward into the ground. This root continues to grow on from its lower end, and thus insinuates itself and penetrates into the soil. The stem meanwhile is adding to its length throughout; it erects itself, and, seeking the light, brings the seed up out of the ground. The materials for this growth have been supplied by the cotyledons or seed-leaves, still in the seed: it was the store of nourishing material they held which gave them their thickish shape, so unlike that of ordinary leaves. Now, relieved of a part of this store of food, which has formed the growth by which they have been raised into the air and light, they appropriate the remainder to their own growth. In enlarging they open and throw off the seed-husk; they expand, diverge into a horizontal position, turn green, and thus become a pair of evident leaves, the first foliage of a tiny plant. This seedling, although diminutive and most simple, possesses and puts into use, all the ORGANS of VEGETATION, namely, root, stem, and leaves, each in its proper element, — the root in the soil, the stem rising out of it, the leaves in the light and open air. It now draws in moisture and some food-materials from the soil by its root, conveys this through the stem into the leaves, where these materials, along with other crude food which these imbibe from the air, are assimilated into vegetable matter, i. e. into the material for further growth.



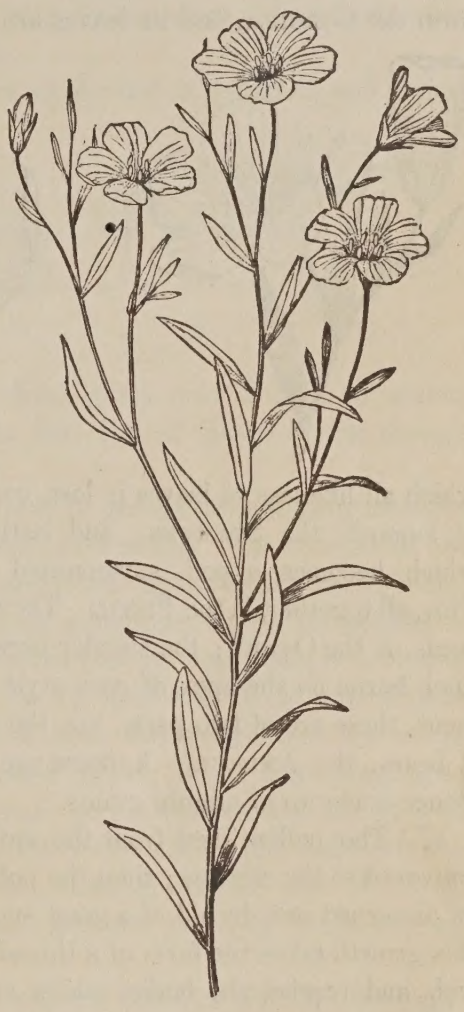
6 5 7

12. **Further Growth** soon proceeds to the formation of new parts, — downward in the production of more root, or of branches of the main root, upward in the development of more stem and leaves. That from which a stem with its leaves is continued, or a new stem (i. e. branch) originated, is a BUD. The most conspicuous and familiar buds are those of most shrubs and trees, bearing buds formed in summer or autumn, to grow the following

FIG. 5. Early Flax seedling; stem (caulicle), root at lower end, expanded seed-leaves (cotyledons) at the other: minute bud (plumule) between these. 6. Same later; the bud developed into second pair of leaves, with hardly any stem-part below them; then into a third pair of leaves, raised on a short joint of stem; and a fifth leaf also showing. 7. Same still older, with more leaves developed, but these singly (one after another), and with joints of stem between them.

spring. But every such point for new growth may equally bear the name. When there is such a bud between the cotyledons in the seed or seedling it is called the PLUMULE. This is conspicuous enough in a bean (Fig. 29.), where the young leaf of the new growth looks like a little plume, whence the name, *plumule*. In flax-seed this is very minute indeed, but is discernible with a magnifier, and in the seedling it shows itself distinctly (Fig. 5, 6, 7).

13. As it grows it shapes itself into a second pair of leaves, which of course rests on a second joint of stem, although in this instance that remains too short to be well seen. Upon its summit appears the third pair of leaves, soon to be raised upon its proper joint of stem; the next leaf is single, and is carried up still further upon its supporting joint of stem; and so on. The root, meanwhile, continues to grow underground, not joint after joint, but continuously, from its lower end; and commonly it before long multiplies itself by branches, which lengthen by the same continuous growth. But stems are built up by a succession of leaf-bearing growths, such as are strongly marked in a reed or corn-stalk, and less so in such an herb as Flax. The word "joint" is ambiguous: it may mean either the portion between successive leaves, or their junction, where the leaves are attached. For precision, therefore, the place where the leaf or leaves are borne is called a NODE, and the naked interval between two nodes, an INTERNODE.



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14. In this way a simple stem with its garniture of leaves is developed from the seed. But besides this direct continuation, buds may form and develop into lateral stems, that is, *into branches*, from any node. The proper origin of branches is from the AXIL of a leaf, i. e. the angle between leaf and stem on the upper side; and branches may again branch, so building up the herb, shrub, or tree. But sooner or later, and without long delay in an annual like Flax, instead of this continuance of mere vegetation, reproduction is prepared for by

FIG. 8. Upper part of Flax-plant in blossom.

15. **Blossoming.** In Flax the flowers make their appearance at the end of the stem and branches. The growth, which otherwise might continue them farther or indefinitely, now takes the form of blossom, and is subservient to the production of seed.

16. **The Flower** of Flax consists, first, of five small green leaves, crowded into a circle: this is the CALYX, or flower-cup. When its separate leaves are referred to they are called SEPALS, a name which distinguishes them from foliage-leaves on the one hand, and from petals on the other. Then come five delicate and *colored* leaves (in the Flax, blue), which form the COROLLA, and its leaves are PETALS; then a circle of organs, in

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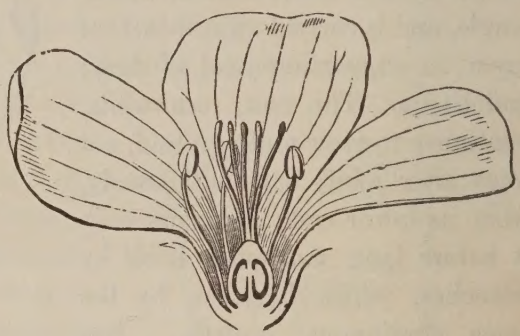


10

which all likeness to leaves is lost, consisting of slender stalks with a knob at summit, the STAMENS; and lastly, in the centre, the rounded body, which becomes a pod, surmounted by five slender or stalk-like bodies. This, all together, is the PISTIL. The lower part of it, which is to contain the seeds, is the OVARY; the slender organs surmounting this are STYLES; the knob borne on the apex of each style is a STIGMA. Going back to the stamens, these are of two parts, viz. the stalk, called FILAMENT, and the body it bears, the ANTHER. Anthers are filled with POLLEN, a powdery substance made up of minute grains.

17. The pollen shed from the anthers when they open falls upon or is conveyed to the stigmas; then the pollen-grains set up a kind of growth (to be discerned only by aid of a good microscope), which penetrates the style: this growth takes the form of a thread more delicate than the finest spider's web, and reaches the bodies which are to become seeds (OVULES they are called until this change occurs); these, touched by this influence, are incited to a new growth within, which becomes an embryo. So, as the ovary ripens into the seed-pod or capsule (Fig. 1, etc.) containing seeds, each seed enclosing a rudimentary new plantlet, the round of this vegetable existence is completed.

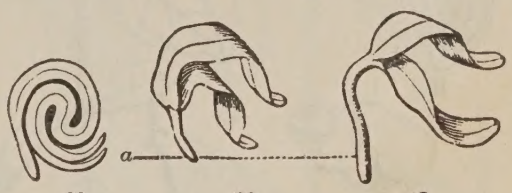
FIG. 9. Flax-flowers about natural size. 10. Section of a flower moderately enlarged, showing a part of the petals and stamens, all five styles, and a section of ovary with two ovules or rudimentary seeds.

Section III. MORPHOLOGY OF SEEDLINGS.

18. Having obtained a general idea of the growth and parts of a phanerogamous plant from the common Flax of the field, the seeds and seedlings of other familiar plants may be taken up, and their variations from the assumed pattern examined.

19. **Germinating Maples** are excellent to begin with, the parts being so much larger than in Flax that a common magnifying glass, although convenient, is hardly necessary. The only disadvantage is that fresh seeds are not readily to be had at all seasons.

20. The seeds of Sugar Maple ripen at the end of summer, and germinate in early spring. The embryo fills the whole seed, in which it is nicely packed; and the nature of the parts is obvious even before growth begins. There is a stemlet (caulicle) and a pair of long and narrow seed-leaves (cotyledons), doubled up and coiled, green even in the seed, and in germination at once unfolding into the first pair of foliage-leaves, though of shape quite unlike those that follow.



21. Red Maple seeds are ripe and ready to germinate at the beginning of summer, and are therefore more convenient for study. The cotyledons are crumpled in the seed, and not easy to straighten out until they unfold themselves in germination. The story of their development into the seedling is told by the accompanying Fig. 14–20; and that of Sugar Maple is closely similar. No plumule or bud appears in the embryo of these two Maples until the seed-leaves have nearly attained their full growth and are acting as foliage-leaves, and until a root is formed below. There is no great store of nourishment in these thin cotyledons; so further growth has to wait until the root and seed-leaves have collected and elaborated sufficient material for the formation of the second internode and its pair of leaves, which lending their help the third pair is more promptly produced, and so on.

22. Some change in the plan comes with the Silver or Soft White Maple. (Fig. 21–25). This blossoms in earliest spring, and it drops its large and ripened keys only a few weeks later. Its cotyledons have not at all the appearance of leaves; they are short and broad, and (as there is no room to be saved by folding) they are straight, except a small fold at the top, — a vestige of the habit of Maples in general. Their unusual thickness is due

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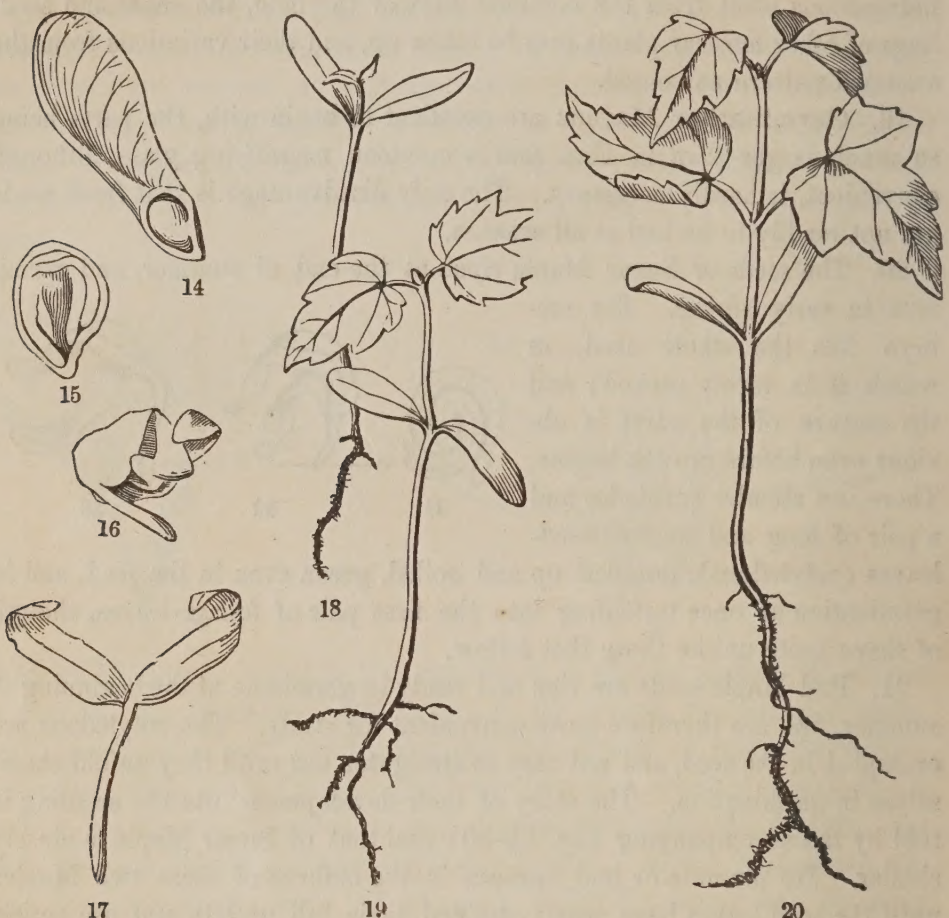
Fig. 11. Embryo of Sugar Maple, cut through lengthwise and taken out of the seed. 12, 13. Whole embryo of same just beginning to grow; *a*, the stemlet or caulicle, which in 13 has considerably lengthened.

to the large store of nutritive matter they contain, and this prevents their developing into actual leaves. Correspondingly, their caulicle does not lengthen to elevate them above the surface of the soil; the growth below the cotyledons is nearly all of root. It is the little plumule or bud between



them which makes the upward growth, and which, being well fed by the cotyledons, rapidly develops the next pair of leaves and raises them upon a long internode, and so on. The cotyledons all the while remain below, in the husk of the fruit and seed, and perish when they have yielded up the store of food which they contained.

23. So, even in plants so much alike as Maples, there is considerable difference in the amount of food stored up in the cotyledons by which the growth is to be made; and there are corresponding differences in the ger-

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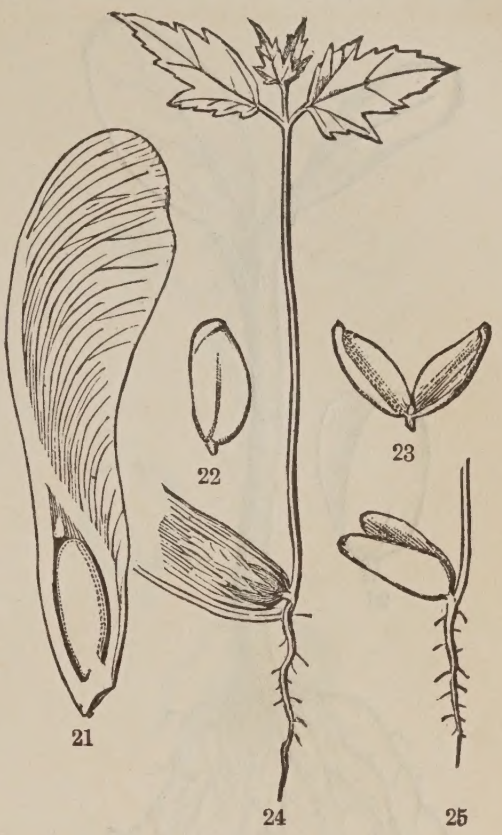
FIG. 14. One of the pair of keys or winged fruits of Red Maple; the seed-bearing portion cut open to show the seed. 15. Seed enlarged, and divided to show the crumpled embryo which fills it. 16. Embryo taken out and partly opened. 17. Embryo which has unfolded in early stage of germination and begun to grow. 18. Seedling with next joint of stem and leaves apparent; and 19 with these parts full-grown, and bud at apex for further growth. 20. Seedling with another joint of stem and pair of leaves.

mination. The larger the supply to draw upon, the stronger the growth, and the quicker the formation of root below and of stem and leaves above. This deposit of food thickens the cotyledons, and renders them less and less leaf-like in proportion to its amount.



24. **Examples of Embryos with thickened Cotyledons.** In the Pumpkin and Squash (Fig. 26, 27), the cotyledons are well supplied with nourishing matter, as their sweet taste demonstrates. Still, they are flat and not very thick. In germination this store is promptly utilized in the development of the caulicle to twenty or thirty times its length in the seed, and to corresponding thickness, in the formation of a cluster of roots at its lower end, and the early production of the incipient plumule; also in their own growth into efficient green leaves. The case of our common Bean (Phaseolus vulgaris, Fig. 28–30) is nearly the same, except that the cotyledons are much more gorged; so that, although carried up into the air and light upon the lengthening caulicle, and there acquiring a green color, they never expand into useful leaves. Instead of this, they nourish into rapid growth the plumule, which is plainly visible in the seed, as a pair of incipient leaves; and these form the first actual foliage.

25. Very similar is the germination of the Beech (Fig. 31–33), except that the caulicle lengthens less, hardly raising the cotyledons out of the ground. Nothing would be gained by elevating them, as they never grow out into efficient leaves; but the joint of stem belonging to the plumule lengthens well, carrying up its pair of real foliage-leaves.

26. It is nearly the same in the Bean of the Old World (Vicia Faba, here called Horse Bean and Windsor Bean): the caulicle lengthens very little, does not undertake to elevate the heavy seed, which is left below or

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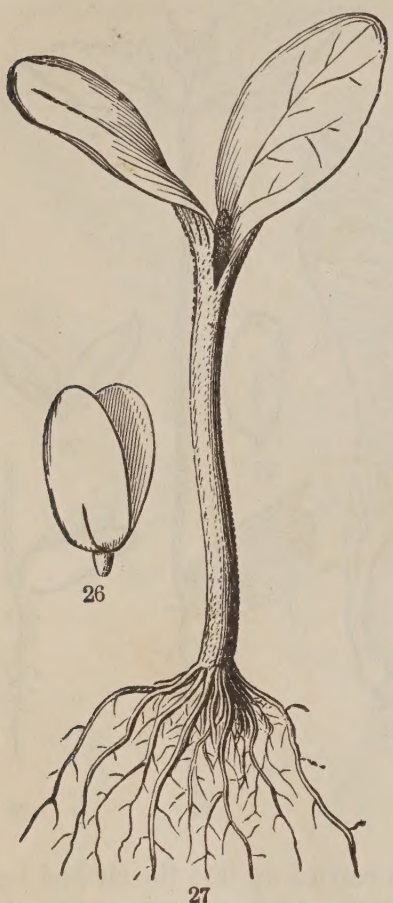
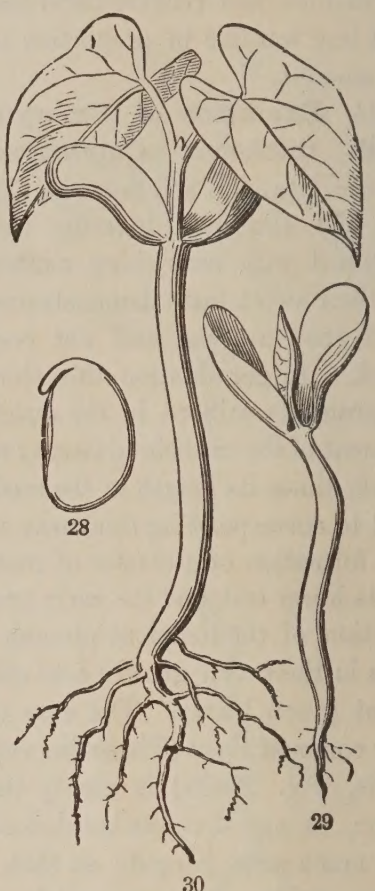
FIG. 21. Fruit (one key) of Silver Maple, Acer dasycarpum, of natural size, the seed-bearing portion divided to show the seed. 22. Embryo of the seed taken out. 23. Same opened out, to show the thick cotyledons and the little plumule or bud between them. 24. Germination of Silver Maple, natural size; merely the base of the fruit, containing the seed, is shown. 25. Embryo of same, taken out of the husk; upper part of growing stem cut off, for want of room.

upon the surface of the soil, the flat but thick cotyledons remaining in it, and supplying food for the growth of the root below and the plumule above. In its near relative, the Pea (Fig. 34, 35), this use of cotyledons





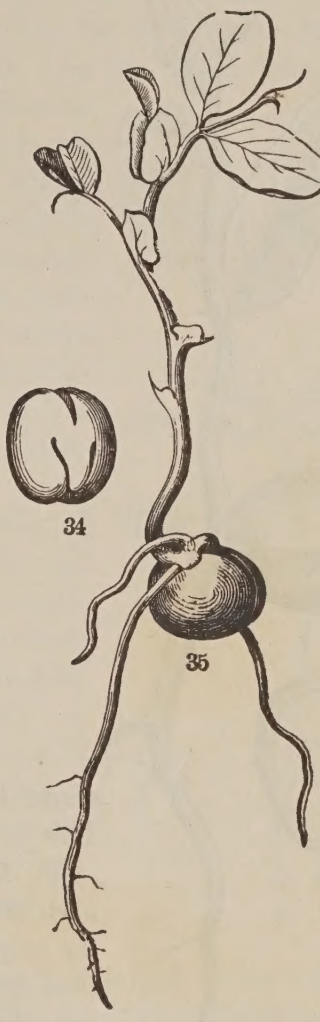
for storage only is most completely carried out. For they are thickened to the utmost, even into hemispheres; the caulicle does not lengthen at all; merely sends out roots from the lower end, and develops its strong plumule from the upper, the seed remaining unmoved underground. That is, in technical language, the germination is *hypogæous*.

27. There is sufficient nourishment in the cotyledons of a pea to make a very considerable growth before any actual foliage is required. So it is the stem-portion of the plumule which is at first conspicuous and strong-growing. Here, as seen in Fig. 35, its lower nodes bear each a useless leaf-scale instead of an efficient leaf, and only the later ones bear leaves fitted for foliage.

FIG. 26. Embryo of Pumpkin-seed, partly opened. 27. Young seedling of same.

FIG. 28. Embryo of Common Bean (Phaseolus vulgaris): caulicle bent down over edge of cotyledons. 29. Same germinating: caulicle well lengthened and root beginning; thick cotyledons partly spreading; and plumule (pair of leaves) growing between them. 30. Same, older, with plumule developed into internode and pair of leaves.

28. This *hypogæous* germination is exemplified on a larger scale by the Oak (Fig. 36, 37) and Horse-chestnut (Fig. 38, 39); but in these the downward growth is wholly a stout tap-root. It is not the caulicle; for



this lengthens hardly any. Indeed, the earliest growth which carries the very short caulicle out of the shell comes from the formation of foot-stalks to the cotyledons; above these develops the strong plumule, below grows the stout root. The growth is at first entirely, for a long time

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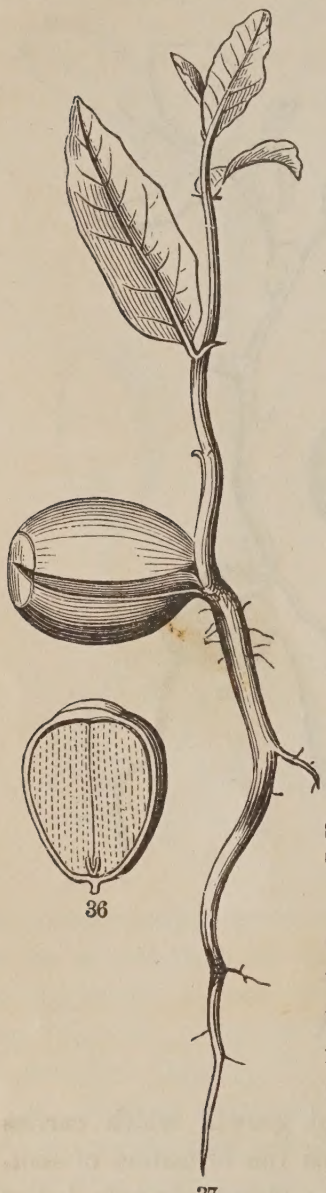
FIG. 31. A Beech-nut, cut across. 32. Beginning germination of the Beech, showing the plumule growing before the cotyledons have opened or the root has scarcely formed. 33. The same, a little later, with the plumule-leaves developing, and elevated on a long internode.

FIG. 34. Embryo of Pea, i. e. a pea with the coats removed; the short and thick caulicle presented to view. 35. Same in advanced germination: the plumule has developed four or five internodes, bearing single leaves; but the first and second leaves are mere scales, the third begins to serve as foliage; the next more so.

mainly, at the expense of the great store of food in the cotyledons. These, after serving their purpose, decay and fall away.

29. Such thick cotyledons never separate; indeed, they sometimes grow together by some part of their contiguous faces; so that the germination seems to proceed from a solid bulb-like mass. This is the case in a horse-chestnut.



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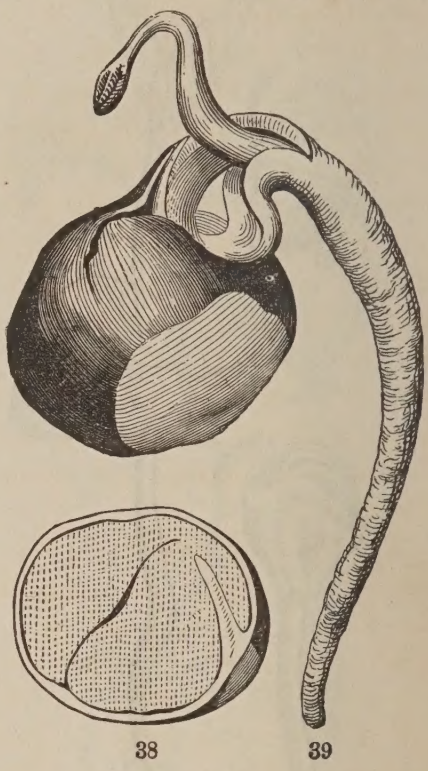

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30. **Germinating Embryo supplied by its own Store of Nourishment**, i. e. the store in the cotyledons. This is so in all the illustrations thus far, essentially so even in the Flax. This nourishment was supplied by the mother plant to the ovule and seed, and thence taken into the embryo during its growth. Such embryos, filling the whole seed, are comparatively large and strong, and vigorous in germination in proportion to the amount of their growth while connected with the parent plant.

31. **Germinating Embryo supplied from a Deposit outside of Itself.** This is as common as the other mode; and it occurs in all degrees.

FIG. 36. Half of an acorn, cut lengthwise, filled by the very thick cotyledons, the base of which encloses the minute caulicle. 37. Oak-seedling.

FIG. 38. Half of a horse-chestnut, similarly cut; the caulicle is curved down on the side of one of the thick cotyledons. 39. Horse-chestnut in germination; footstalks are formed to the cotyledons, pushing out in their lengthening the growing parts.

Some seeds have very little of this deposit, but a comparatively large embryo, with its parts more or less developed and recognizable. In others this deposit forms the main bulk of the seed, and the embryo is small or minute, and comparatively rudimentary. The following illustrations exemplify these various grades. When an embryo in a seed is thus surrounded by a white substance, it was natural to liken the latter to the white of an egg, and the embryo or germ to the yolk. So the matter around or by the side of the embryo was called the *Albumen*, i. e. the white of the seed. The analogy is not very good; and to avoid ambiguity some botanists call it the ENDOSPERM. As that means in English merely the inwards of a seed, the new name is little better than the old one; and, since we do not change names in botany except when it cannot be avoided, this name of *albumen* is generally kept up. A seed with such a deposit is *albuminous*, one with none is *exalbuminous*.

32. The ALBUMEN forms the main bulk of the seed in wheat, maize, rice, buckwheat, and the like. It is the floury part of the seed. Also of the cocoa-nut, of coffee (where it is dense and hard), etc.; while in peas, beans, almonds, and in most edible nuts, the store of food, although essentially the same in nature and in use, is in the embryo itself, and therefore is not counted as anything to be separately named. In both forms this concentrated food for the germinating plant is food also for man and for animals.

33. For an albuminous seed with a well-developed embryo, the common Morning Glory (Ipomœa purpurea, Fig. 40–43) is a convenient example, being easy and prompt to grow, and having all the parts well apparent. The seeds (duly soaked for examination) and the germination should be compared with those of Sugar and Red Maple (19–21). The only essential difference is that here the embryo is surrounded by and crumpled up in the albumen. This substance, which is pulpy or mucilaginous in fresh and young seeds, hardens as the seed ripens, but becomes again pulpy in germination; and, as it liquifies, the thin cotyledons absorb it by their

FIG. 40. Seed of Morning Glory divided, moderately magnified; shows a longitudinal section through the centre of the embryo as it lies crumpled in the albumen. 41. Embryo taken out whole and unfolded; the broad and very thin cotyledons notched at summit; the caulicle below. 42. Early state of germination. 43. Same, more advanced; caulicle or primary stem, cotyledons or seed-leaves, and below, the root, well developed.

whole surface. It supplements the nutritive matter contained in the embryo. Both together form no large store, but sufficient for establishing the seedling, with tiny root, stem, and pair of leaves for initiating its independent growth; which in due time proceeds as in Fig. 44, 45.

34. Smaller embryos, less developed in the seed, are more dependent upon the extraneous supply of food. The figures 46–53 illustrate four

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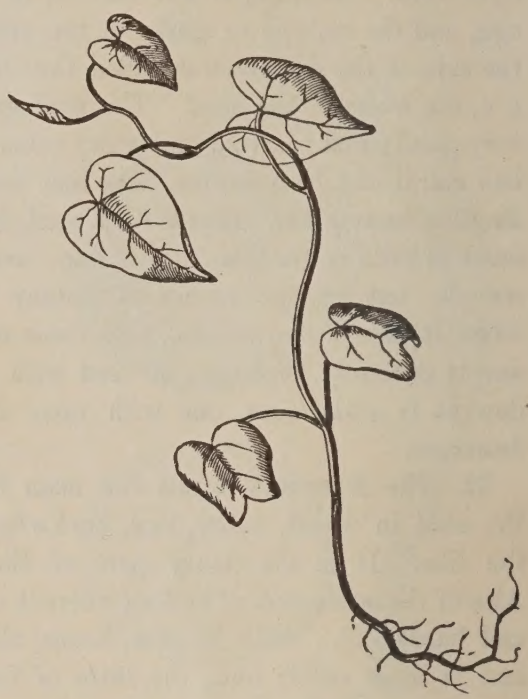

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grades in this respect. The smallest, that of the Peony, is still large enough to be seen with a hand magnifying glass, and even its cotyledons may be discerned by the aid of a simple stage microscope.

35. The broad cotyledons of Mirabilis, or Four-o'clock (Fig. 52, 53), with the slender caulicle almost encircle and enclose the floury albumen, instead of being enclosed in it, as in the other illustrations. Evidently here the germinating embryo is principally fed by one of the leaf-like cotyledons, the other being out of contact with the supply. In the embryo of Abronia (Fig. 54, 55), a near relative of Mirabilis, there is a singular modification; one cotyledon is almost wanting, being reduced to a rudiment, leaving it for the other to do the work. This leads to the question of the

36. **Number of Cotyledons.** In all the preceding illustrations, the embryo, however different in shape and degree of development, is evidently

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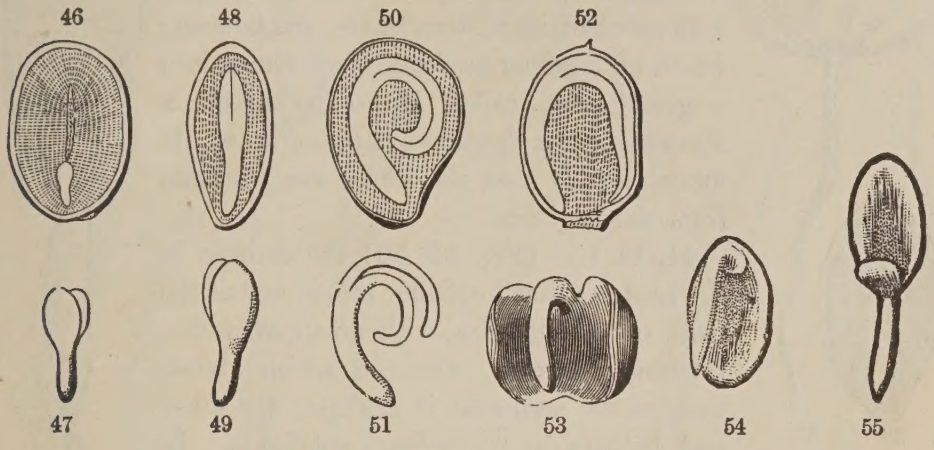
FIG. 44. Seedling of Morning Glory more advanced (root cut away); cotyledons well developed into foliage-leaves: succeeding internode and leaf well developed, and the next forming. 45. Seedling more advanced; reduced to much below natural size.

constructed upon one and the same plan, namely, that of two leaves on a caulicle or initial stem, — a plan which is obvious even when one cotyledon becomes very much smaller than the other, as in the rare instance of Abronia (Fig. 54, 55). In other words, the embryos so far examined are all

37. **Dicotyledonous**, that is, two-cotyledoned. Plants which are thus similar in the plan of the embryo agree likewise in the general structure of



their stems, leaves, and blossoms; and thus form a class, named from their embryo DICOTYLEDONES, or in English, DICOTYLEDONOUS PLANTS. So long a name being inconvenient, it may be shortened into DICOTYLS.

38. **Polycotyledonous** is a name employed for the less usual case in which there are more than two cotyledons. The Pine is the most familiar case. This occurs in all Pines, the number of cotyledons varying from three to twelve; in Fig. 56, 57 they are six. Note that they are all on the same level, that is, belong to the same node, so as to form a circle or *whorl* at the summit of the caulicle. When there are only three cotyledons, they divide the space equally, are one third of the circle apart. When only two they are 180° apart, that is, are *opposite*.

39. The case of three or more cotyledons, which is constant in Pines and in some of their relatives (but not in all of them), is occasional among Dicotyls. And the polycotyledonous is only a variation of the dicotyledonous type, — a difference in the number of leaves in the whorl; for a pair is a whorl reduced to two members. Some suppose that there are really only

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FIG. 46. Section of a seed of a Peony, showing a very small embryo in the albumen, near one end. 47. This embryo detached, and more magnified.

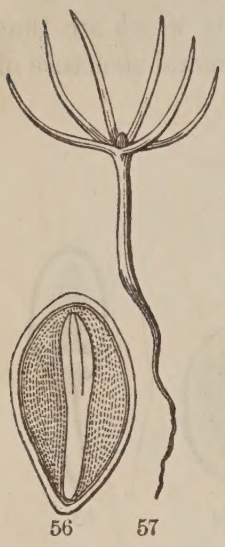
FIG. 48. Section of a seed of Barberry, showing the straight embryo in the middle of the albumen. 49. Its embryo detached.

FIG. 50. Section of a Potato-seed, showing the embryo coiled in the albumen. 51. Its embryo detached.

FIG. 52. Section of the seed of Mirabilis or Four-o'clock, showing the embryo coiled round the outside of the albumen. 53. Embryo detached; showing the very broad and leaf-like cotyledons, applied face to face, and the pair incurved.

FIG. 54. Embryo of Abronia umbellata; one of the cotyledons very small. 55. Same straightened out.

two cotyledons even in a Pine-embryo, but these divided or split up congenitally so as to imitate a greater number. But as leaves are often in whorls on ordinary stems, they may be so at the very beginning.



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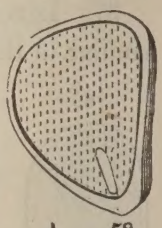
40. Monocotyledonous (meaning with single cotyledon) is the name of the one-cotyledoned sort of embryo. This goes along with peculiarities in stem, leaves, and flowers; which all together associate such plants into a great class, called Monocotyledonous Plants, or, for shortness, Monocotyls. It means merely that the leaves are alternate from the very first.

41. In Iris (Fig. 58, 59) the embryo in the seed is a small cylinder at one end of the mass of the albumen, with no apparent distinction of parts. The end which almost touches the seed-coat is caulicle; the other end belongs to the solitary cotyledon. In germination the whole lengthens (but mainly the cotyledon) only enough to push the proximate end fairly out of the seed: from this end the root is formed; and from a little higher the plumule later emerges. It would appear, therefore, that the cotyledon answers to a minute leaf rolled up, and that a chink through which the plumule grows out is a part of the inrolled edges. The embryo of Indian Corn shows these parts on a larger scale and in a more open state (Fig. 66–68). There, in the seed, the cotyledon remains, imbibing nourishment from the softened albumen, and transmitting it to the growing root below and new-forming leaves above.



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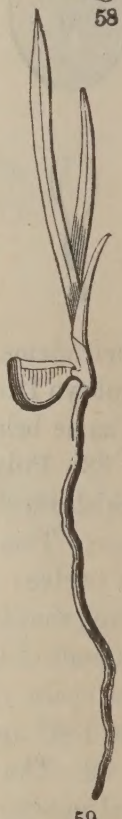

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42. The general plan is the same in the Onion (Fig. 60–65), but with a striking difference. The embryo is long, and coiled in the albumen of the seed. To ordinary examination it shows no distinction of parts. But germination plainly shows that all except the lower end of it is cotyledon. For after it has lengthened into a long thread, the chink from which the

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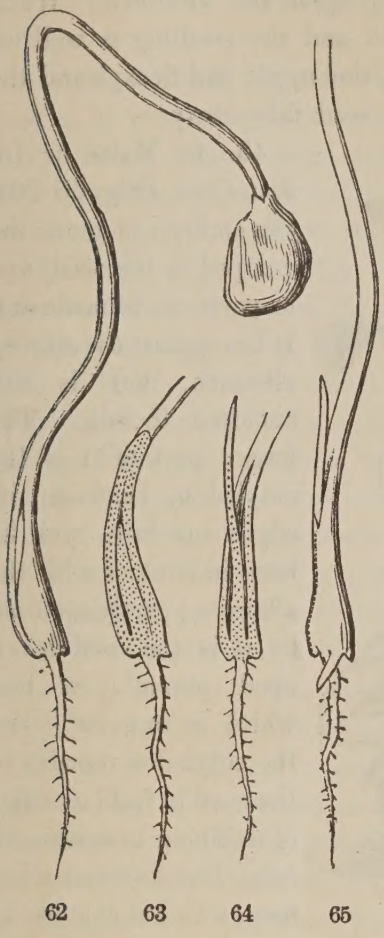
Fig. 56. Section of a Pine-seed, showing its polycotyledonous embryo in the centre of the albumen; moderately magnified. 57. Seedling of same, showing the freshly expanded six cotyledons in a whorl, and the plumule just appearing.

Fig. 58. Section of a seed of the Iris, or Flower-de-Luce, enlarged, showing its small embryo in the albumen, near the bottom. 59. A germinating seedling of the same, its plumule developed into the first four leaves (alternate), the first one rudimentary; the cotyledon remains in the seed.

Fig. 60. Section of an Onion-seed, showing the slender and coiled embryo in the albumen: moderately magnified. 61. Seed of same in early germination.

plumule in time emerges is seen at the base, or near it; so the caulicle is



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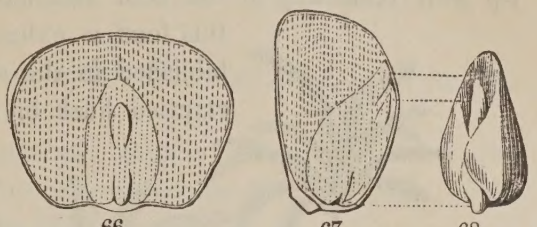

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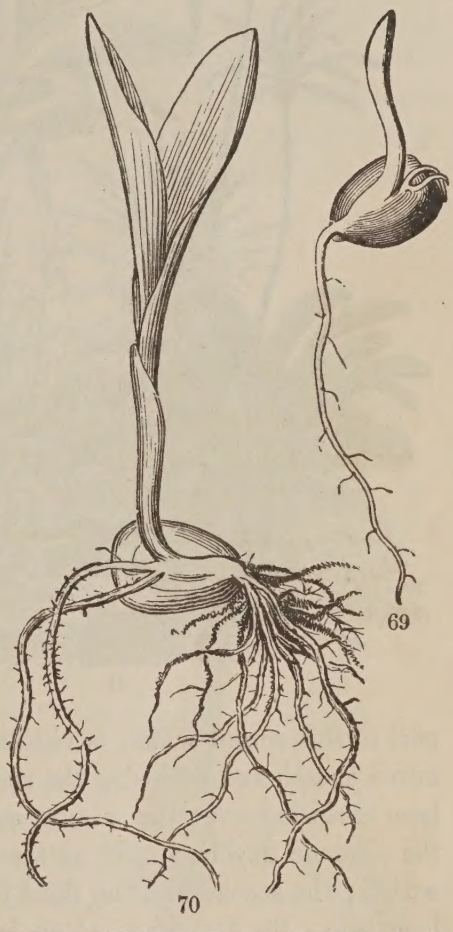

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extremely short, and does not elongate, but sends out from its base a simple root, and afterwards others in a cluster. Not only does the cotyledon lengthen enormously in the seedling, but (unlike that of Iris, Indian Corn, and all

FIG. 62. Germinating Onion, more advanced; the chink at base of cotyledon opening for the protrusion of the plumule, consisting of a thread-shaped leaf. 63. Section of base of Fig. 62, showing plumule enclosed. 64. Section of same later; plumule emerging. 65. Later stage of 62; upper part cut off. 66. A grain of Indian Corn, flatwise, cut away a little, so as to show the embryo, lying on the albumen, which makes the principal bulk of the seed. 67. A grain cut through the middle in the opposite direction, dividing the embryo through its thick cotyledon and its plumule, the latter consisting of two leaves, one enclosing the other. 68. The embryo, taken out whole: the thick mass is the cotyledon; the narrow body partly enclosed by it is the plumule; the little projection at its base is the very short radicle enclosed in the sheathing base of the first leaf of the plumule.

FIG. 69. Grain of Indian Corn in germination; the ascending sprout is the first leaf of the plumule, enclosing the younger leaves within; at its base the primary root has broken through. 70. The same, advanced; the second and third leaves developing, while the sheathing first leaf does not further develop.

the cereal grains) it raises the comparatively light seed into the air, the tip still remaining in the seed and feeding upon the albumen. When this food is exhausted and the seedling is well established in the soil, the upper end decays and the emptied husk of the seed falls away.

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43. In Maize or Indian Corn (Fig. 66-70), the embryo is more developed in the seed, and its parts can be made out. It lies against the starchy albumen, but is not enclosed therein. The larger part of it is the cotyledon, thickish, its edges involute, and its back in contact with the albumen; partly enclosed by it is the well-developed plumule or bud which is to grow. For the cotyledon remains in the seed to fulfil its office of imbibing nourishment from the softened albumen, which it conveys to the growing sprout; the part of this sprout which is visible is the first leaf of the plumule rolled up into a sheath and enclosing the rudiments of the succeeding leaves, at the base enclosing even the minute caulicle. In germination the first leaf of the plumule develops only as a sort of sheath, protecting the tender parts within; the second and the third form the first foliage. The caulicle never lengthens: the first root, which is formed at its lower end, or from any part of it, has to break through the enclosing sheath; and succeeding roots soon spring from all or any of the nodes of the plumule.

44. **Simple-stemmed Plants** are thus built up, by the continuous production of one leaf-bearing portion of stem from the summit of the preceding one, beginning with the initial stem (or caulicle) in the embryo. Some Dicotyls and many Monocotyls develop only in this single line of growth (as to parts above ground) until the flowering state is approached. For some examples, see Cycas (Fig. 71, front, at the left); a tall Yucca or Spanish Bayonet, and two Cocoa-nut Palms behind; at the right, a group of Sugar-canes, and a Banana behind.

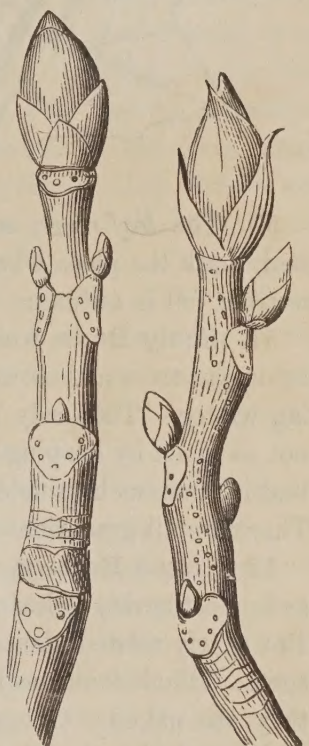
FIG. 71. Simple-stemmed vegetation.

SECTION IV. GROWTH FROM BUDS: BRANCHING.

45. Most plants increase the amount of their vegetation by branching, that is, by producing lateral shoots.

46. Roots branch from any part and usually without definite order. Stems normally give rise to branches only at definite points, namely, at the nodes, and there only from the axils of leaves.

47. **Buds** (Fig. 72, 73). Every incipient shoot is a *Bud* (12). A stem continues its growth by its *terminal bud;* it branches by the formation and development of *lateral buds.* As normal lateral buds occupy the axils of leaves, they are called *axillary buds.* As leaves are symmetrically arranged on the stem, the buds in their axils and the branches into which axillary buds grow partake of this symmetry. The most conspicuous buds are the scaly winter-buds of most shrubs and trees of temperate and cold climates; but the name belongs as well to the forming shoot or branch of any herb.



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48. **The Terminal Bud**, in the most general sense, may be said to exist in the embryo, — as cotyledons, or the cotyledons and plumule, — and to crown each successive growth of the simple stem so long as the summit is capable of growth. The whole ascending growth of the Palm, Cycas, and the like (such as in Fig. 71) is from a terminal bud. Branches, being repetitions of the main stem and growing in the same way, are also lengthened by terminal buds. Those of Horse-chestnut, Hickory, Maples, and such trees, being the resting buds of winter, are conspicuous by their protective covering of scales. These bud-scales, as will hereafter be shown, are themselves a kind of leaves.

49. **Axillary Buds** were formed on these annual shoots early in the summer. Occasionally they grow the same season into branches; at least, some of them are pretty sure to do so whenever the growing terminal bud at the end of the shoot is injured or destroyed. Otherwise they may lie dormant until the following spring. In many trees or shrubs these axillary buds do not show themselves until spring; but if searched for, they may be detected, though of small size, hidden under the bark. Sometimes, although early

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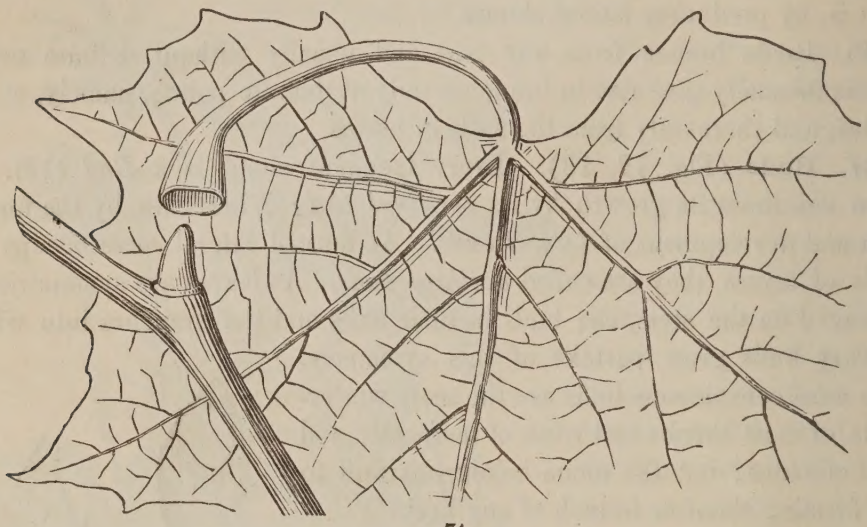
FIG. 72. Shoot of Horse-chestnut, of one year's growth, taken in autumn after the leaves have fallen; showing the large terminal bud and smaller axillary buds.

FIG. 73. Similar shoot of Shagbark Hickory, Carya alba.

formed, they are concealed all summer long under the base of the leaf-stalk, which is then hollowed out into a sort of inverted cup, like a candle-extinguisher, to cover them; as in the Locust, the Yellow-wood, or more strikingly in the Button-wood or Plane-tree (Fig. 74).



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50. The *leaf-scars*, so conspicuous in Fig. 72, 73, under each axillary bud, mark the place where the stalk of the subtending leaf was attached until it fell in autumn.

51. **Scaly Buds**, which are well represented in Fig. 72, 73, commonly belong to trees and shrubs of countries in which growth is suspended during winter. The scaly coverings protect the tender young parts beneath, not so much by keeping out the cold, which of course would penetrate the bud in time, as by shielding the interior from the effects of sudden changes. There are all gradations between these and

52. **Naked Buds**, in which these scales are inconspicuous or wanting, as in most herbs, at least above ground, and most tropical trees and shrubs. But nearly related plants of the same climate may differ widely in this respect. Rhododendrons have strong and scaly winter-buds; while in Kalmia they are naked. One species of Viburnum, the Hobble-bush, has completely naked buds, what would be a pair of scales developing into the first leaves in spring; while another (the Snowball) has conspicuous scaly buds.

53. **Vigor of Vegetation from strong buds.** Large and strong buds, like those of the Horse-chestnut, Hickory, and the like, contain several leaves, or pairs of leaves, ready formed, folded and packed away in small compass, just as the seed-leaves of a strong embryo are packed away in the seed: they may even contain all the blossoms of the ensuing season, plainly visible as small buds. And the stems upon which these buds rest are filled with abundant nourishment, which was deposited the summer before in the

FIG. 74. An axillary bud, concealed under the hollowed base of the leafstalk, in Buttonwood or Plane-tree.

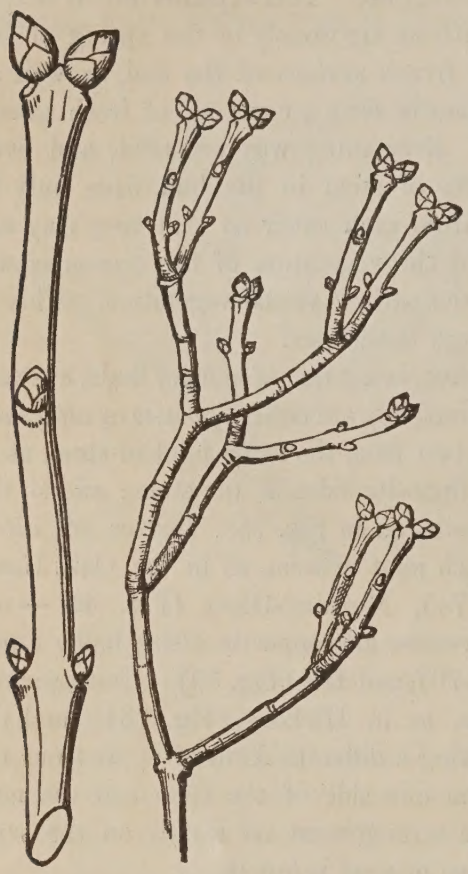
wood or in the bark. Under the surface of the soil, or on it covered with the fallen leaves of autumn, similar strong buds of our perennial herbs may be found; while beneath are thick roots, rootstocks, or tubers, charged with a great store of nourishment for their use. This explains how it is that vegetation from such buds shoots forth so vigorously in the spring of the year, and clothes the bare and lately frozen surface of the soil, as well as the naked boughs of trees, very promptly with a covering of fresh green, and often with brilliant blossoms. Everything was prepared, and even formed, beforehand: the short joints of stem in the bud have only to lengthen, and to separate the leaves from each other so that they may unfold and grow. Only a small part of the vegetation of the season comes directly from the seed, and none of the earliest vernal vegetation. This is all from buds which have lived through the winter.

54. **The Arrangement of Branches**, being that of axillary buds, answers to that of the leaves. Now leaves principally are either *opposite* or *alternate*. Leaves are *opposite* when there are two from the same joint of stem, as in Maples (Fig. 20), the two being on opposite sides of the stem; and so the axillary buds and branches are opposite, as in Fig. 75. Leaves are *alternate* when there is only one from each joint of stem, as in the Oak, Lime-tree, Poplar, Button-wood (Fig. 74), Morning-Glory (Fig. 45, — not counting the seed-leaves, which of course are opposite, there being a pair of them); also in Indian Corn (Fig. 70), and Iris (Fig. 59). Consequently the axillary buds are also alternate, as in Hickory (Fig. 73); and the branches they form alternate, — making a different kind of spray from the other mode, one branch shooting on one side of the stem and the next on some other. For in the alternate arrangement no leaf is on the same side of the stem as the one next above or next below it.

55. But the symmetry of branches (unlike that of the leaves) is rarely complete. This is due to several causes, and most commonly to the

56. **Non-development of buds.** It never happens that all the buds grow. If they did, there might be as many branches in any year as there were leaves the year before. And of those which do begin to grow, a large portion perish, sooner or later, for want of nourishment, or for want of light, or because those which first begin to grow have an advantage, which they are apt to keep, taking to themselves the nourishment of the stem, and starving the weaker buds. In the Horse-chestnut (Fig. 72), Hickory (Fig. 73), Magnolia, and most other trees with large scaly buds, the terminal bud is the strongest, and has the advantage in growth; and next in strength are the upper axillary buds: while the former continues the shoot of the last year, some of the latter give rise to branches, and the rest fail to grow. In the Lilac also (Fig. 75), the uppermost axillary buds are stronger than the lower; but the terminal bud rarely appears at all; in its place the uppermost pair of axillary buds grow, and so each stem branches every year into two, — making a repeatedly two-forked ramification, as in Fig. 76.

57. **Latent Buds.** Axillary buds that do not grow at the proper season, and especially those which make no appearance externally, may long remain latent, and at length upon a favorable occasion start into growth, so forming branches apparently out of place as they are out of time. The new shoots seen springing directly out of large stems may sometimes originate from such latent buds, which have preserved their life for years. But commonly these arise from



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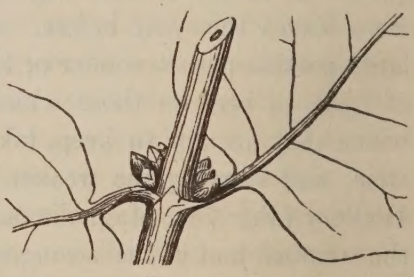
58. **Adventitious Buds.** These are buds which certain shrubs and trees produce anywhere on the surface of the wood, especially where it has been injured. They give rise to the slender twigs which often feather the sides of great branches of our American Elms. They sometimes form on the root, which naturally is destitute of buds; they are even found upon some leaves; and they are sure to appear on the trunks and roots of Willows, Poplars, and Chestnuts, when these are wounded or mutilated. Indeed Osier-Willows are *pollarded*, or cut off, from time to time, by the cultivator, for the purpose of producing a crop of slender adventitious twigs, suitable for basket-work. Such branches, being altogether irregular, of course interfere with the natural symmetry of the tree. Another cause of irregularity, in certain trees and shrubs, is the formation of what are called



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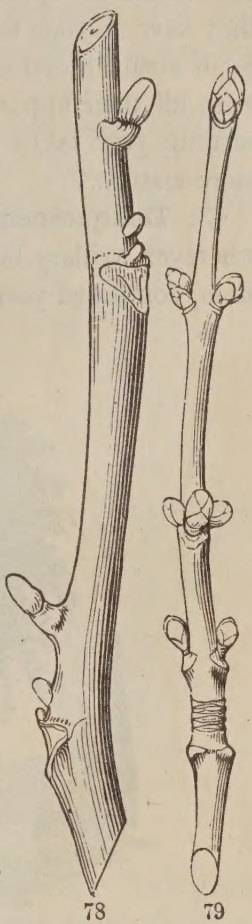
59. **Accessory or Supernumerary Buds.** There are cases where two, three, or more buds spring from the axil of a leaf, instead of the single one which is ordinarily found there. Sometimes they are placed one over the other, as in the Aristolochia or Pipe-Vine, and in the Tartarean Honeysuckle (Fig. 77); also in the Honey-Locust, and in the Walnut and Butternut (Fig. 78), where

FIG. 75. Shoot of Lilac, with winter buds; the two uppermost axillary ones strong; the terminal not developed. 76. Forking ramification of Lilac; reduced in size.

FIG. 77. Tartarean Honeysuckle, with three accessory buds in each axil.

the upper supernumerary bud is a good way out of the axil and above the others. And this is here stronger than the others, and grows into a branch which is considerably out of the axil, while the lower and smaller ones commonly do not grow at all. In other cases three buds stand side by side in the axil, as in the Hawthorn, and the Red Maple (Fig. 79.) If these were all to grow into branches, they would stifle each other. But some of them are commonly flower-buds: in the Red Maple, only the middle one is a leaf-bud, and it does not grow until after those on each side of it have expanded the blossoms they contain.



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60. **Sorts of Buds.** It may be useful to enumerate the kinds of buds which have been described or mentioned. They are

Terminal, when they occupy the summit of (or terminate) a stem,

Lateral, when they are borne on the side of a stem; of which the regular kind is the

Axillary, situated in the axil of a leaf. These are

Accessory or *Supernumerary*, when they are in addition to the normal solitary bud; and these are *Collateral*, when side by side; *Superposed*, when one above another;

Extra-axillary, when they appear above the axil, as some do when superposed, and as occasionally is the case when single.

Naked buds; those which have no protecting scales.

Scaly buds; those which have protecting scales, which are altered leaves or bases of leaves.

Leaf-buds, contain or give rise to leaves, and develop into a leafy shoot.

Flower-buds, contain or consist of blossoms, and no leaves.

Mixed buds, contain both leaves and blossoms.

61. **Definite annual Growth** from winter buds is marked in most of the shoots from strong buds, such as those of the Horse-chestnut and Hickory (Fig. 72, 73). Such a bud generally contains, already formed in miniature, all or a great part of the leaves and joints of stem it is to produce, makes its whole growth in length in the course of a few weeks, or sometimes even in a few days, and then forms and ripens its buds for the next year's similar growth.

62. **Indefinite annual Growth**, on the other hand, is well marked in such trees or shrubs as the Honey-Locust, Sumac, and in sterile shoots of

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FIG. 78. Butternut branch, with accessory buds, the uppermost above the axil.

FIG. 79. Red-Maple branch, with accessory buds placed side by side. The annular lines toward the base in this and in Fig. 72 are scars of the bud-scales, and indicate the place of the winter-bud of the preceding year.

the Rose, Blackberry, and Raspberry. That is, these shoots are apt to grow all summer long, until stopped by the frosts of autumn or some other cause. Consequently they form and ripen no terminal bud protected by scales, and the upper axillary buds are produced so late in the season that they have no time to mature, nor has their wood time to solidify and ripen. Such stems therefore commonly die back from the top in winter, or at least all their upper buds are small and feeble; so the growth of the succeeding year takes place mainly from the lower axillary buds, which are more mature.

63. **Deliquescent and Excurrent Growth.** In the former case, and wherever axillary buds take the lead, there is, of course, no single main stem, continued year after year in a direct line, but the trunk is soon lost

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in the branches. Trees so formed commonly have rounded or spreading tops. Of such trees with *deliquescent* stems, — that is, with the trunk dissolved, as it were, into the successively divided branches, — the common American Elm (Fig. 80) is a good illustration.

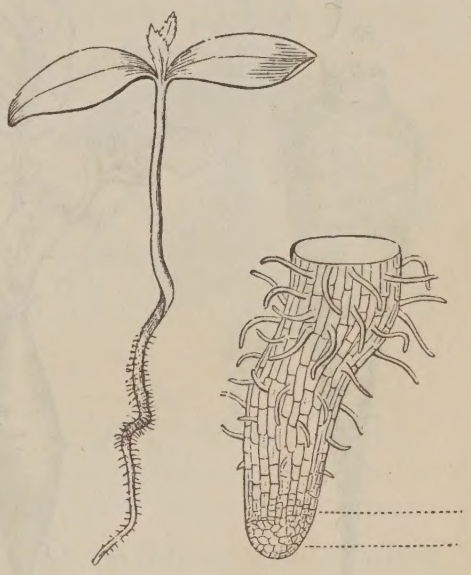
64. On the other hand, the main stem of Firs and Spruces, unless destroyed by some injury, is carried on in a direct line throughout the whole growth of the tree, by the development year after year of a terminal bud: this forms a single, uninterrupted shaft, — an *excurrent* trunk, which cannot be confounded with the branches that proceed from it. Of such *spiry* or *spire-shaped* trees, the Firs or Spruces are characteristic and familiar examples. There are all gradations between the two modes.

FIG. 80. An American Elm, with Spruce-trees, and on the left Arbor Vitæ.

Section V. ROOTS.

65. It is a property of stems to produce roots. Stems do not spring from roots in ordinary cases, as is generally thought, but roots from stems. When perennial herbs arise from the ground, as they do at spring-time, they rise from subterranean stems.

66. **The Primary Root** is a downward growth from the root-end of the caulicle, that is, of the initial stem of the embryo (Fig. 5–7, 81). If it goes on to grow it makes a *main* or *tap-root*, as in Fig. 37, etc. Some plants keep this main root throughout their whole life, and send off only small side branches; as in the Carrot and Radish: and in various trees, like the Oak, it takes the lead of the side-branches for several years, unless accidentally injured, as a strong tap-root. But commonly the main root divides off very soon, and is lost in the branches. *Multiple primary roots* now and then occur, as in the seedling of Pumpkin (Fig. 27), where a cluster is formed even at the first, from the root-end of the caulicle.



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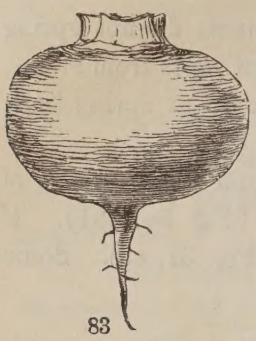
67. **Secondary Roots** are those which arise from other parts of the stem. Any part of the stem may produce them, but they most readily come from the nodes. As a general rule they naturally spring, or may be made to spring, from almost any young stem, when placed in favorable circumstances, — that is, when placed in the soil, or otherwise supplied with moisture and screened from the light. For the special tendency of the root is to avoid the light, seek moisture, and therefore to bury itself in the soil. *Propagation by division*, which is so common and so very important in cultivation, depends upon the proclivity of stems to strike root. Stems or branches which remain under ground give out roots as freely as roots themselves give off branches. Stems which creep on the ground most commonly root at the joints; so will most branches when bent to the ground, as in propagation by *layering;* and propagation by *cuttings* equally depends upon the tendency of the cut end of a shoot to produce roots. Thus, a piece of a plant which has stem and leaves, either developed or in the bud, may be made to produce roots, and so become an independent plant.

FIG. 81. Seedling Maple, of the natural size; the root well supplied with root-hairs, here large enough to be seen by the naked eye. 82. Lower end of this root, magnified, the root seen just as root-hairs are beginning to form a little behind the tip.

68. **Contrast between Stem and Root.** Stems are ascending axes; roots are descending axes. Stems grow by the successive development of internodes (13), one after another, each leaf-bearing at its summit (or node); so that it is of the essential nature of a stem to bear leaves. Roots bear no leaves, are not distinguishable into nodes and internodes, but grow on continuously from the lower end. They commonly branch freely, but not from any fixed points nor in definite order.



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69. Although roots generally do not give rise to stems, and therefore do not propagate the plant, exceptions are not uncommon. For as stems may produce adventitious buds, so also may roots. The roots of the Sweet Potato among herbs, and of the Osage Orange among trees freely produce adventitious buds, developing into leafy shoots; and so these plants are propagated by *root-cuttings*. But most growths of subterranean origin which pass for roots are forms of stems, the common Potato for example.

70. Roots of ordinary kinds and uses may be roughly classed into *fibrous* and *fleshy*.

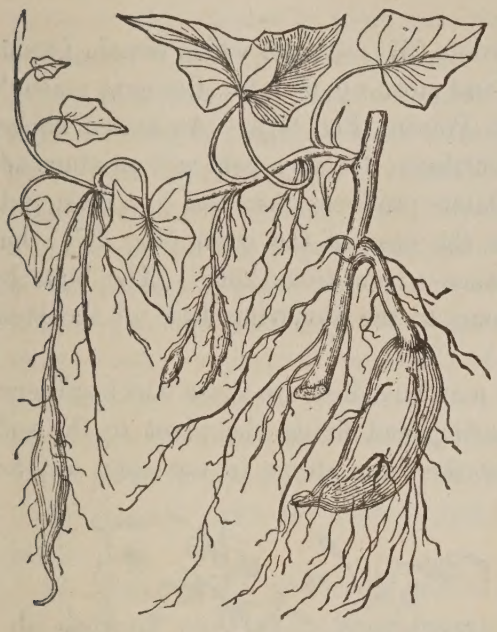
71. **Fibrous Roots**, such as those of Indian Corn (Fig. 70), of most annuals, and of many perennials, serve only for absorption: these are slender or thread-like. Fine roots of this kind, and the fine branches which most roots send out are called ROOTLETS.

72. The whole surface of a root absorbs moisture from the soil while fresh and new; and the newer roots and rootlets are, the more freely do they imbibe. Accordingly, as long as the plant grows above ground, and expands fresh foliage, from which moisture largely escapes into the air, so long it continues to extend and multiply its roots in the soil beneath, renewing and increasing the fresh surface for absorbing moisture, in proportion to the demand from above. And when growth ceases above ground, and the leaves die and fall, or no longer act, then the roots generally stop growing,

FIG. 83–85. Forms of tap-root.

and their soft and tender tips harden. From this period, therefore, until growth begins anew the next spring, is the best time for transplanting; especially for trees and shrubs.

73. The absorbing surface of young roots is much increased by the formation, near their tips, of ROOT-HAIRS (Fig. 81, 82), which are delicate



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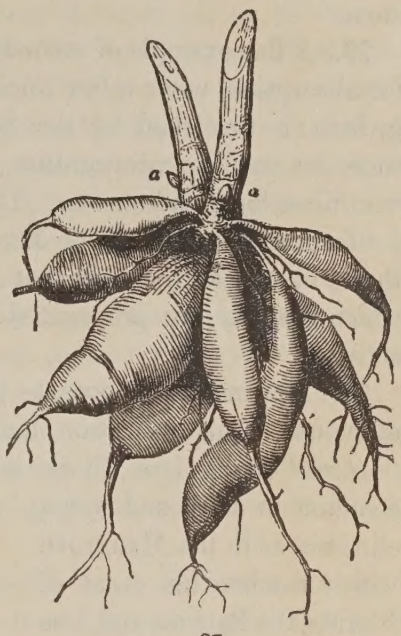

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tubular outgrowths from the surface, through the delicate walls of which moisture is promptly imbibed.

74. **Fleshy Roots** are those in which the root becomes a storehouse of nourishment. Typical roots of this kind are those of such biennials as the turnip and carrot; in which the food created in the first season's vegetation is accumulated, to be expended the next season in a vigorous growth and a rapid development of flowers, fruit, and seed. By the time the seed is matured the exhausted root dies, and with it the whole plant.

75. Fleshy roots may be single or multiple. The single root of the commoner biennials is the primary root, or tap-root, which begins to thicken in the seedling. Names are given to its shapes, such as

Conical, when it thickens most at the crown, or where it joins the stem, and tapers regularly downwards to a point, as in the Parsnip and Carrot (Fig. 84);

Turnip-shaped or *napiform*, when greatly thickened above, but abruptly becoming slender below; as the Turnip (Fig. 83); and

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FIG. 86. Sweet-Potato plant forming thickened roots. Some in the middle are just beginning to thicken; one at the left has grown more; one at the right is still larger.

FIG. 87. Fascicled fusiform roots of a Dahlia: *a*, *a*, buds on base of stem.

Spindle-shaped, or *Fusiform*, when thickest in the middle and tapering to both ends; as the common Radish (Fig. 85).

76. These examples are of primary roots. It will be seen that turnips, carrots, and the like, are not pure root throughout; for the caulicle, from the lower end of which the root grew, partakes of the thickening, perhaps also some joints of stem above: so the bud-bearing and growing top is stem.

77. A fine example of secondary roots (67), some of which remain fibrous for absorption, while a few thicken and store up food for the next season's growth, is furnished by the Sweet Potato (Fig. 86). As stated above, these are used for propagation by cuttings; for any part will produce adventitious buds and shoots. The Dahlia produces *fascicled* (i. e. clustered) fusiform roots of the same kind, at the base of the stem (Fig. 87): but these, like most roots, do not produce adventitious buds. The buds by which Dahlias are propagated belong to the surviving base of the stem above.

78. **Anomalous Roots**, as they may be called, are those which subserve other uses than absorption, food-storing, and fixing the plant to the soil.

Aerial Roots, i. e. those that strike from stems in the open air, are common in moist and warm climates, as in the Mangrove which reaches the coast of Florida, the Banyan, and, less strikingly, in some herbaceous plants, such as Sugar Cane, and even in Indian Corn. Such roots reach the ground at length, or tend to do so.

Aerial Rootlets are abundantly produced by many climbing plants, such as the Ivy, Poison Ivy, Trumpet Creeper, etc., springing from the side of stems, which they fasten to trunks of trees, walls, or other supports. These are used by the plant for climbing.

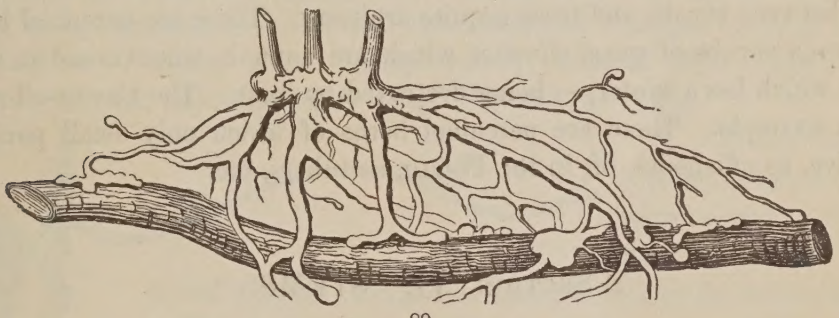
79. **Epiphytes, or Air-Plants** (Fig. 88), are called by the former name because commonly growing

FIG. 88. Epiphytes of Florida and Georgia, viz., Epidendrum conopseum, a small Orchid, and Tillandsia usneoides, the so-called Long Moss or Black Moss, which is no moss, but a flowering plant, also *T. recurvata*; on a bough of Live Oak.

upon the trunks or limbs of other plants; by the latter because, having no connection with the soil, they must derive their sustenance from the air only. They have aerial roots, which do not reach the ground, but are used to fix the plant to the surface upon which the plant grows: they also take a part in absorbing moisture from the air.

80. **Parasitic Plants**, of which there are various kinds, strike their roots, or what answer to roots, into the tissue of foster plants, or form attachments with their surface, so as to prey upon their juices. Of this sort is the Mistletoe, the seed of which germinates on the bough where it falls or is left by birds; and the forming root penetrates the bark and engrafts itself into the wood, to which it becomes united as firmly as a natural branch to its parent stem; and indeed the parasite lives just as if it were a branch of the tree it grows and feeds on. A most common parasitic herb is the Dodder; which abounds in low grounds in summer, and coils its long and slender, leafless, yellowish stems — resembling tangled threads of yarn — round and round the stalks of other plants; wherever they touch piercing the bark with minute and very short rootlets in the form of suckers, which draw out the nourishing juices of the plants laid hold of. Other parasitic plants, like the Beech-drops and Pine-sap, fasten their roots under ground upon the roots of neighboring plants, and rob them of their juices.

81. Some plants are partly parasitic; while most of their roots act in the ordinary way, others make suckers at their tips which grow fast to the



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roots of other plants and rob them of nourishment. Some of our species of Gerardia do this (Fig. 89).

82. There are phanerogamous plants, like Monotropa or Indian Pipe, the roots of which feed mainly on decaying vegetable matter in the soil. These are SAPROPHYTES, and they imitate Mushrooms and other Fungi in their mode of life.

83. **Duration of Roots, etc.** Roots are said to be either *annual*, *biennial*, or *perennial*. As respects the first and second, these terms may be applied either to the root or to the plant.

84. **Annuals**, as the name denotes, live for only one year, generally for

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FIG. 89. Roots of Yellow Gerardia, some attached to and feeding on the root of a Blueberry-bush.

only a part of the year. They are of course herbs; they spring from the seed, blossom, mature their fruit and seed, and then die, root and all. Annuals of our temperate climates with severe winters start from the seed in spring, and perish at or before autumn. Where the winter is a moist and growing season and the summer is dry, *winter annuals* prevail; their seeds germinate under autumn or winter rains, grow more or less during winter, blossom, fructify, and perish in the following spring or summer. Annuals are fibrous-rooted.

85. **Biennials**, of which the Turnip, Beet, and Carrot are familiar examples, grow the first season without blossoming, usually thicken their roots, laying up in them a stock of nourishment, are quiescent during the winter, but shoot vigorously, blossom, and seed the next spring or summer, mainly at the expense of the food stored up, and then die completely. Annuals and biennials flower only once; hence they have been called *Monocarpic* (that is, once-fruiting) plants.

86. **Perennials** live and blossom year after year. A perennial herb, in a temperate or cooler climate, usually dies down to the ground at the end of the season's growth. But subterranean portions of stem, charged with buds, survive to renew the development. Shrubs and trees are of course perennial; even the stems and branches above ground live on and grow year after year.

87. There are all gradations between annuals and biennials, and between these and perennials, as also between herbs and shrubs; and the distinction between shrubs and trees is quite arbitrary. There are perennial herbs and even shrubs of warm climates which are annuals when raised in a climate which has a winter, — being destroyed by frost. The Castor-oil plant is an example. There are perennial herbs of which only small portions survive, as off-shoots, or, in the Potato, as tubers, etc.

SECTION VI. STEMS.

88. **The Stem** is the axis of the plant, the part which bears all the other organs. Branches are secondary stems, that is, stems growing out of stems. The stem at the very beginning produces roots, in most plants a single root from the base of the embryo-stem, or caulicle. As this root becomes a *descending axis*, so the stem, which grows in the opposite direction is called the *ascending axis*. Rising out of the soil, the stem bears leaves; and leaf-bearing is the particular characteristic of the stem. But there are forms of stems that remain underground, or make a part of their growth there. These do not bear leaves, in the common sense; yet they bear rudiments of leaves, or what answers to leaves, although not in the form of foliage. The so-called stemless or *acaulescent* plants are those which bear no obvious stem (*caulis*) above ground, but only flower-stalks, and the like.

89. **Stems above ground,** through differences in duration, texture, and size, form herbs, shrubs, trees, etc., or in other terms are

Herbaceous, dying down to the ground every year, or after blossoming.

Suffrutescent, slightly woody below, there surviving from year to year.

Suffruticose or *Frutescent,* when low stems are decidedly woody below, but herbaceous above.

Fruticose or *Shrubby,* woody, living from year to year, and of considerable size, — not, however, more than three or four times the height of a man.

Arborescent, when tree-like in appearance or mode of growth, or approaching a tree in size.

Arboreous, when forming a proper tree-trunk.

90. As to direction taken in growing, stems may, instead of growing upright or erect, be

Diffuse, that is, loosely spreading in all directions.

Declined, when turned or bending over to one side.

Decumbent, reclining on the ground, as if too weak to stand.

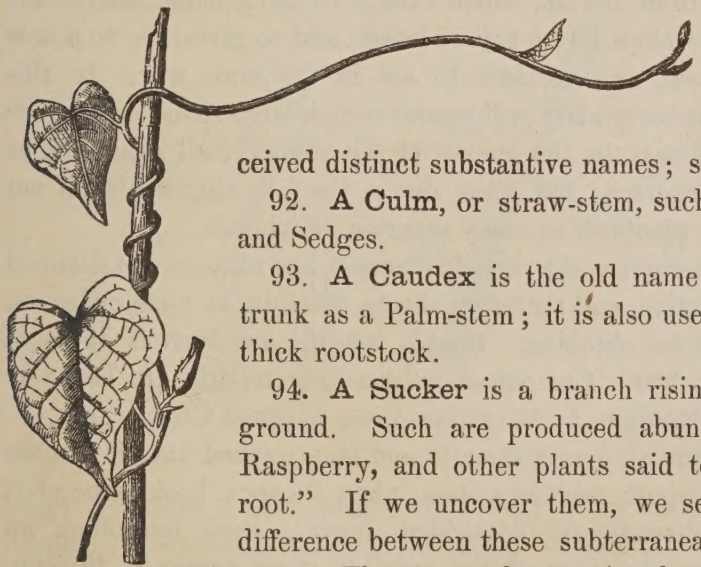
Assurgent or *Ascending,* rising obliquely upwards.

Procumbent or *Prostrate,* lying flat on the ground from the first.

Creeping or *Repent,* prostrate on or just beneath the ground, and striking root, as does the White Clover, the Partridge-berry, etc.

Climbing or *Scandent,* ascending by clinging to other objects for support, whether by *tendrils,* as do the Pea, Grape-Vine, and Passion-flower and Virginia Creeper (Fig. 92, 93); by their twisting leaf-stalks, as the Virgin's Bower; or by rootlets, like the Ivy, Poison Ivy, and Trumpet Creeper.

Twining or *Voluble,* when coiling spirally around other stems or supports; like the Morning-Glory (Fig. 90) and the Hop.



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91. Certain kinds of stems or branches, appropriated to special uses, have received distinct substantive names; such as the following:

92. **A Culm,** or straw-stem, such as that of Grasses and Sedges.

93. **A Caudex** is the old name for such a peculiar trunk as a Palm-stem; it is also used for an upright and thick rootstock.

94. **A Sucker** is a branch rising from stems under ground. Such are produced abundantly by the Rose, Raspberry, and other plants said to multiply "by the root." If we uncover them, we see at once the great difference between these subterranean branches and real roots. They are only creeping branches under ground. Remarking how the upright shoots from these branches become separate

FIG. 90. Twining or voluble stem of Morning-Glory.

plants, simply by the dying off of the connecting under-ground stems, the gardener expedites the result by cutting them through with his spade. That is, he propagates the plant "by division."

95. **A Stolon** is a branch from above ground, which reclines or becomes prostrate and strikes root (usually from the nodes) wherever it rests on the soil. Thence it may send up a vigorous shoot, which has roots of its own, and becomes an independent plant when the connecting part dies, as it does after a while. The Currant and the Gooseberry naturally multiply in this way, as well as by suckers (which are the same thing, only the connecting part is concealed under ground). Stolons must have suggested the operation of *layering* by bending down and covering with soil branches which do not naturally make stolons; and after they have taken root, as they almost always will, the gardener cuts through the connecting stem, and so converts a rooting branch into a separate plant.

96. **An Offset** is a short stolon, or sucker, with a crown of leaves at the end, as in the Houseleek (Fig. 91), which propagates abundantly in this way.

91

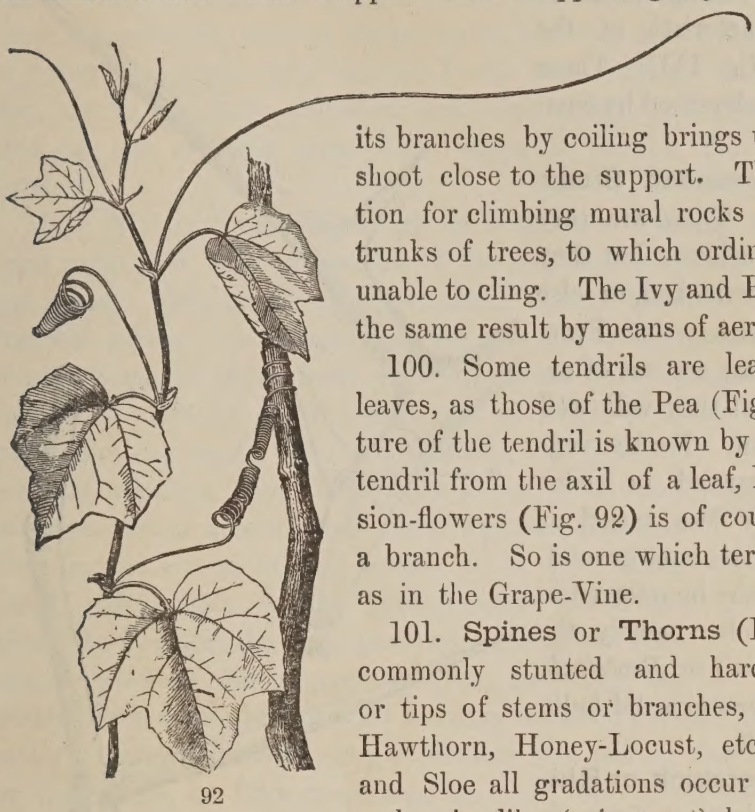
97. **A Runner**, of which the Strawberry presents the most familiar and characteristic example, is a long and slender, tendril-like stolon, or branch from next the ground, destitute of conspicuous leaves. Each runner of the Strawberry, after having grown to its full length, strikes root from the tip, which fixes it to the ground, then forms a bud there, which develops into a tuft of leaves, and so gives rise to a new plant, which sends out new runners to act in the same way. In this manner a single Strawberry plant will spread over a large space, or produce a great number of plants, in the course of the summer, all connected at first by the slender runners; but these die in the following winter, if not before, and leave the plants as so many separate individuals.

98. **Tendrils** are branches of a very slender sort, like runners, not destined like them for propagation, and therefore always destitute of buds or leaves, being intended only for climbing. Simple tendrils are such as those of Passion-flowers (Fig. 92). Compound or branching tendrils are borne by the Cucumber and Pumpkin, by the Grape-Vine, Virginia Creeper, etc.

99. A tendril commonly grows straight and outstretched until it reaches some neighboring support, such as a stem, when its apex hooks around it to secure a hold; then the whole tendril shortens itself by coiling up spirally, and so draws the shoot of the growing plant nearer to the supporting object. But the tendrils of the Virginia Creeper (Ampelopsis, Fig.

FIG. 91. Houseleek (Sempervivum), with offsets

93), as also the shorter ones of the Japanese species, effect the object differently, namely, by expanding the tips of the tendrils into a flat disk, with an adhesive face. This is applied to the supporting object, and it adheres firmly; then a shortening of the tendril and its branches by coiling brings up the growing shoot close to the support. This is an adaptation for climbing mural rocks or walls, or the trunks of trees, to which ordinary tendrils are unable to cling. The Ivy and Poison Ivy attain the same result by means of aerial rootlets (78).



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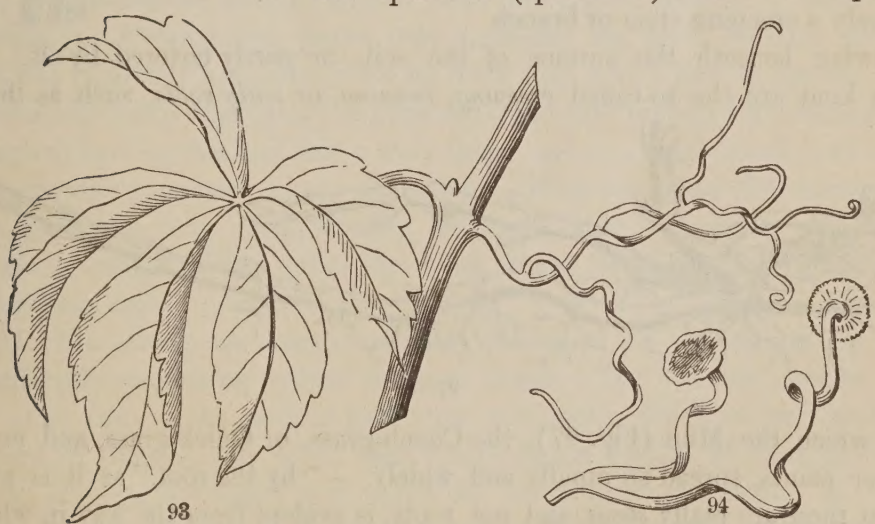
100. Some tendrils are leaves or parts of leaves, as those of the Pea (Fig. 35). The nature of the tendril is known by its position. A tendril from the axil of a leaf, like that of Passion-flowers (Fig. 92) is of course a stem, i. e. a branch. So is one which terminates a stem, as in the Grape-Vine.

101. **Spines** or **Thorns** (Fig. 95, 96) are commonly stunted and hardened branches or tips of stems or branches, as are those of Hawthorn, Honey-Locust, etc. In the Pear and Sloe all gradations occur between spines and spine-like (spinescent) branches. Spines



93 94

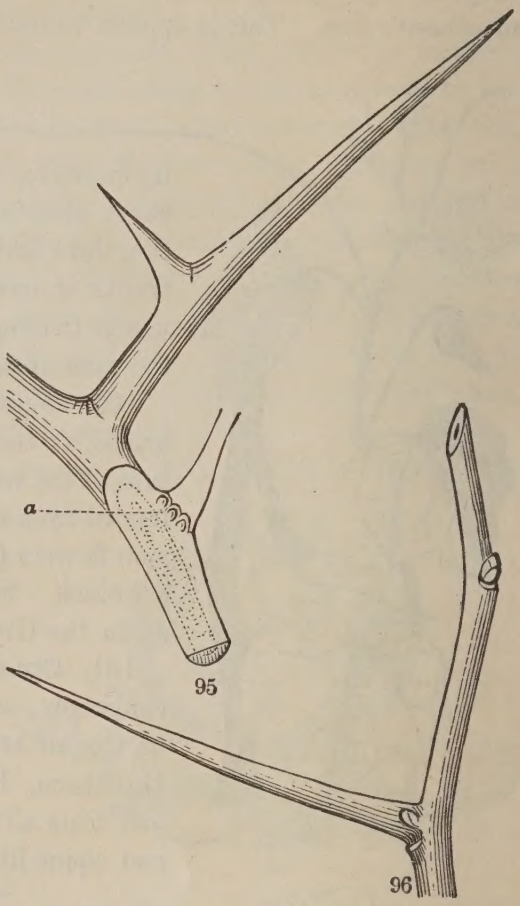
may be reduced and indurated leaves; as in the Barberry, where their nature is revealed by their situation, underneath an axillary bud. But

FIG. 92. A small Passion-flower (*Passiflora sicyoides*), showing the tendrils.

FIG. 93. Piece of the stem of Virginia Creeper, bearing a leaf and a tendril. 94. Tips of a tendril, about the natural size, showing the disks by which they hold fast to walls, etc.

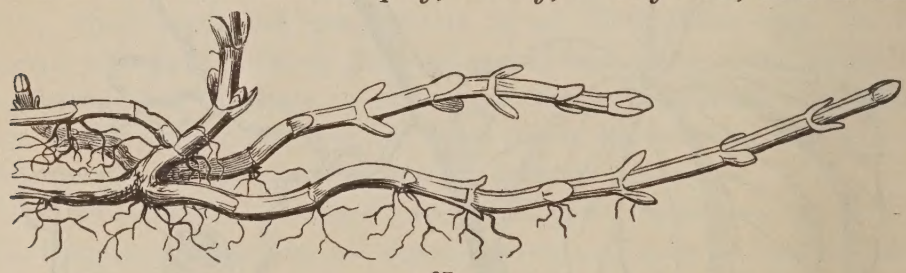
prickles, such as those of Blackberry and Roses, are only excrescences of the bark, and not branches.

102. Equally strange forms of stems are characteristic of the Cactus family (Fig. 111). These may be better understood by comparison with



103. **Subterranean Stems and Branches.** These are very numerous and various; but they are commonly overlooked, or else are confounded with roots. From their situation they are out of ordinary sight; but they will well repay examination. For the vegetation that is carried on under ground is hardly less varied or important than that above ground. All their forms may be referred to four principal kinds: namely, the *Rhizoma* (*Rhizome*) or *Rootstock*, the *Tuber*, the *Corm* or solid bulb, and the true *Bulb*.

104. **The Rootstock, or Rhizoma**, in its simplest form, is merely a creeping stem or branch growing beneath the surface of the soil, or partly covered by it. Of this kind are the so-called *creeping*, *running*, or *scaly roots*, such as those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by which the Mint (Fig. 97), the Couch-grass, or Quick-grass, and many other plants, spread so rapidly and widely, — "by the root," as it is said. That these are really *stems*, and not roots, is evident from the way in which

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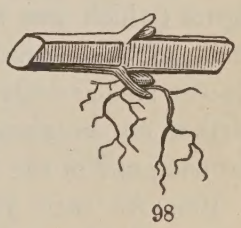
FIG. 95. A branching thorn of Honey Locust, being an indurated leafless branch developed from an accessory bud far above the axil: at the cut portion below, three other buds (*a*) are concealed under the petiole.

FIG. 96. Spine of Cockspur Thorn, developed from an axillary bud, as the leaf-scar below witnesses: an accessory leaf-bud is seen at its base.

FIG. 97. Rootstocks, or creeping subterranean branches, of the Peppermint.

they grow; from their consisting of a succession of joints; and from the leaves which they bear on each *node*, in the form of small scales, just like the lowest ones on the upright stem next the ground. They also produce buds in the axils of these scales, showing the scales to be leaves; whereas real roots bear neither leaves nor axillary buds. Placed as they are in the damp and dark soil, such stems naturally produce roots, just as the creeping stem does where it lies on the surface of the ground.

105. It is easy to see why plants with these running rootstocks take such rapid and wide possession of the soil, and why they are so hard to get rid of. They are always perennials; the subterranean shoots live over the first winter, if not longer, and are provided with vigorous buds at every joint. Some of these buds grow in spring into upright stems, bearing foliage, to elaborate nourishment, and at length produce blossoms for reproduction by seed; while many others, fed by nourishment supplied from above, form a new generation of subterranean shoots; and this is repeated over and over in the course of the season or in succeeding years. Meanwhile, as the subterranean shoots increase in number, the older ones, connecting the successive growths, die off year by year, liberating the already rooted side-branches as so many separate plants; and so on indefinitely. Cutting these running rootstocks into pieces, therefore, by the hoe or the plough, far from destroying the plant, only accelerates the propagation; it converts one many-branched plant into a great number of separate individuals. Cutting into pieces only multiplies the pest; for each piece (Fig. 98) is already a plantlet, with its roots and with a bud in the axil of its scale-like leaf (either latent or apparent), and with prepared nourishment enough to develop this bud into a leafy stem; and so a single plant is all the more speedily converted into a multitude. Whereas, when the subterranean parts are only roots, cutting away the stem completely destroys the plant, except in the rather rare cases where the root freely produces adventitious buds.



98

106. Rootstocks are more commonly thickened by the storing up of considerable nourishing matter in their tissue. The common species of Iris (Fig. 164) in the gardens have stout rootstocks, which are only partly covered by the soil, and which bear foliage-leaves instead of mere scales, closely covering the upper part, while the lower produces roots. As the leaves die, year by year, and decay, a scar left in the form of a ring marks the place where each leaf was attached, that is, marks so many nodes, separated by very short internodes.

107. Some rootstocks are marked with large round scars of a different

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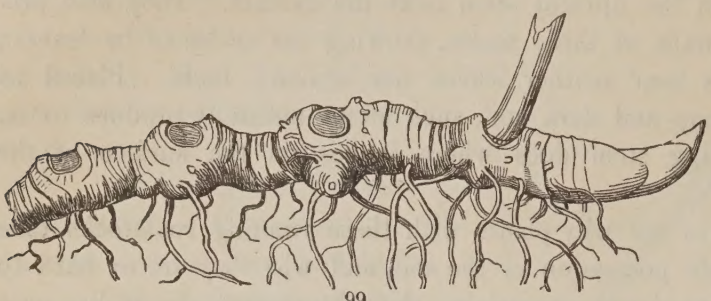
FIG. 98. A piece of the running rootstock of the Peppermint, with its node or joint, and an axillary bud ready to grow.

sort, like those of the Solomon's Seal (Fig. 99), which gave this name to the plant, from their looking somewhat like the impression of a seal upon wax. Here the rootstock sends up every spring an herbaceous stalk or stem, which bears the foliage and flowers, and dies in autumn. The *seal* is the circular scar left by the death and separation of the base of the stout stalk from the living rootstock. As but one of these is formed each year, they mark the limits of a year's growth. The bud at the end of the rootstock in the figure (which was taken in summer) will grow the next spring into the stalk of the season, which, dying in autumn, will leave a similar scar, while another bud will be formed farther on, crowning the ever-advancing summit or growing end of the stem.



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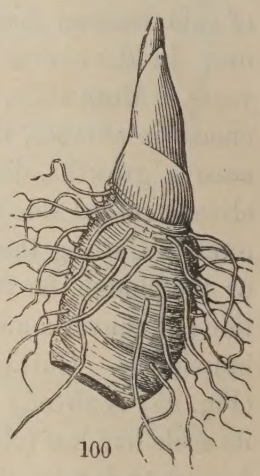
108. As each year's growth of stem makes its own roots, it soon becomes independent of the older parts. And after a certain age, a portion annually dies off behind, about as fast as it increases at the growing end, death following life with equal and certain step, with only a narrow interval. In vigorous plants of Solomon's Seal or Iris, the living rootstock is several inches or a foot in length; while in the short rootstock of Trillium or Birthroot (Fig. 100) life is reduced to a narrower span.



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109. An upright or short rootstock, like this of Trillium, is commonly called a CAUDEX (93); or when more shortened and thickened it would become a corm.

110. **A Tuber** may be understood to be a portion of a rootstock thickened, and with buds (eyes) on the sides. Of course, there are all gradations between a tuber and a rootstock. Helianthus tuberosus, the so-called Jerusalem Artichoke (Fig. 101), and the common Potato, are typical and familiar examples of the tuber. The stalks by which the tubers are attached to the parent stem are at once seen to be different from the roots, both in appearance and manner of growth. The scales on the tubers are the rudiments of leaves; the eyes are the buds in their axils. The Potato-plant

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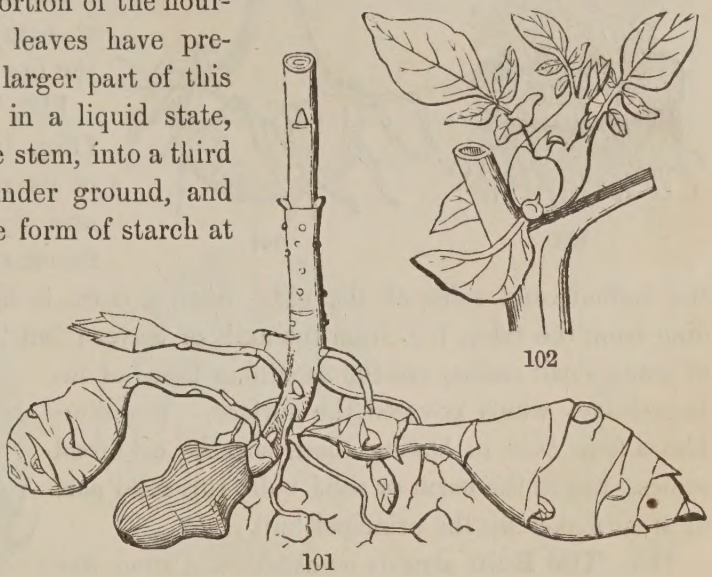
FIG. 99. Rootstock of Solomon's Seal, with the bottom of the stalk of the season, and the bud for the next year's growth.

FIG. 100. The very short rootstock and strong terminal bud of a Trillium or Birthroot.

has three forms of branches: 1. Those that bear ordinary leaves expanded in the air, to digest what they gather from it and what the roots gather from the soil, and convert it into nourishment. 2. After a while a second set of branches at the summit of the plant bear flowers, which form fruit and seed out of a portion of the nourishment which the leaves have prepared. 3. But a larger part of this nourishment, while in a liquid state, is carried down the stem, into a third sort of branches under ground, and accumulated in the form of starch at their extremities, which become tubers, or depositories of prepared solid food, — just as in the Turnip, Carrot, and Dahlia (Fig. 83–87), it is deposited in the root. The use of the store of food is obvious enough. In the autumn the whole plant dies, except the seeds (if it formed them) and the tubers; and the latter are left disconnected in the ground. Just as that small portion of nourishing matter which is deposited in the seed feeds the embryo when it germinates, so the much larger portion deposited in the tuber nourishes its buds, or eyes, when they likewise grow, the next spring, into new plants. And the great supply enables them to shoot with a greater vigor at the beginning, and to produce a greater amount of vegetation than the seedling plant could do in the same space of time; which vegetation in turn may prepare and store up, in the course of a few weeks or months, the largest quantity of solid nourishing material, in a form most available for food. Taking advantage of this, man has transported the Potato from the cool Andes of Chili to other cool climates, and makes it yield him a copious supply of food, especially important in countries where the season is too short, or the summer's heat too little, for profitably cultivating the principal grain-plants.



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101

111. **The Corm or Solid Bulb**, like that of Cyclamen (Fig. 103), and of Indian Turnip (Fig. 104), is a very short and thick fleshy subterranean stem, often broader than high. It sends off roots from its lower end, or rather face, leaves and stalks from its upper. The corm of Cyclamen goes on to enlarge and to produce a succession of flowers and leaves year after year.

FIG. 101. Tubers of Helianthus tuberosus, called "artichokes."

FIG. 102. Bulblet-like tubers, such as are occasionally formed on the stem of a Potato-plant above ground.

That of Indian Turnip is formed one year and is consumed the next. Fig. 104 represents it in early summer, having below the corm of last year, from which the roots have fallen. It is partly consumed by the growth of the stem for the season, and the corm of the year is forming at base of the stem above the line of roots.

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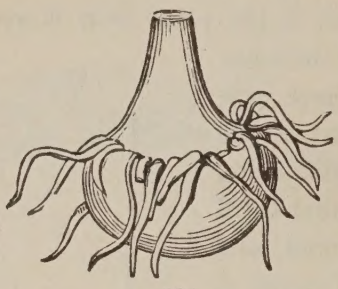

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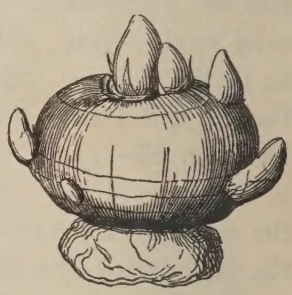
112. The corm of Crocus (Fig. 105, 106), like that of its relative Gladiolus, is also reproduced annually, the new ones forming upon the summit and sides of the old. Such a corm is like a tuber in budding from the sides, i. e. from the axils of leaves; but these leaves, instead of being small scales, are the sheathing bases of foliage-leaves which covered the surface. It resembles a true bulb in having these sheaths or broad scales; but in the corm or solid bulb, this solid part or stem makes up the principal bulk.



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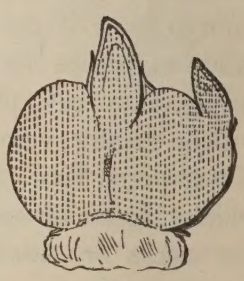
113. **The Bulb**, strictly so-called, is a stem like a reduced corm as to its solid part (or plate); while the main body consists of thickened scales, which are leaves or leaf-bases. These are like bud-scales; so that in fact a bulb is a bud with fleshy scales on an exceedingly short stem. Compare a White Lily bulb (Fig. 107) with the strong scaly buds of the Hickory and Horse-chestnut (Fig. 72 and 73), and the resemblance will appear. In corms, as in tubers and rootstocks, the store of food for future growth is deposited in the stem; while in the bulb, the greater part is deposited in the bases of the leaves, changing them into thick scales, which closely overlap or enclose one another.



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114. **A Scaly Bulb** (like that of the Lily, Fig. 107, 108) is one in which the scales are thick but comparatively narrow.

115. **A Tunicated or Coated Bulb** is one in which the scales enwrap each other, forming concentric coats or layers, as in Hyacinth and Onion.

FIG. 103. Corm of Cyclamen, much reduced in size: roots from lower face, leaf-stalks and flower-stalks from the upper.

FIG. 104. Corm of Indian Turnip (Arisæma).

FIG. 105. Corm of a Crocus, the investing sheaths or dead leaf-bases stripped off. The faint cross-lines represent the scars, where the leaves were attached, i. e. the nodes: the spaces between are the internodes. The exhausted corm of the previous year is underneath; forming ones for next year on the summit and sides.

FIG. 106. Section of the same.

116. **Bulblets** are very small bulbs growing out of larger ones; or small bulbs produced above ground on some plants, as in the axils of the leaves of the bulbiferous Lilies of the gardens (Fig. 110), and often in the flower-clusters of the Leek and Onion. They are plainly buds with thickened scales. They never grow into branches, but detach themselves when full grown, fall to the ground, and take root there to form new plants.

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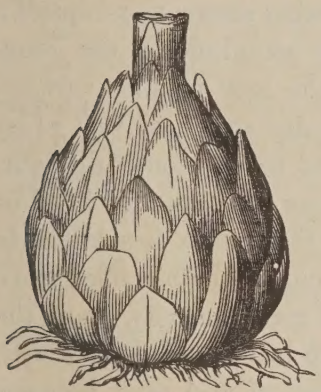
117. **Consolidated Vegetation.** An ordinary herb, shrub, or tree is evidently constructed on the plan developing an extensive surface. In fleshy rootstocks,



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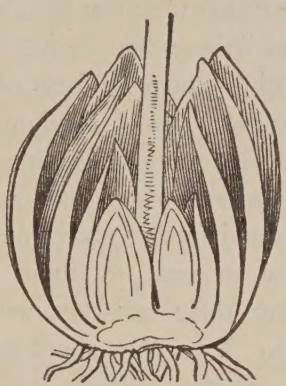

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tubers, corms, and bulbs, the more enduring portion of the plant is concentrated, and reduced for the time of struggle (as against drought, heat, or cold) to a small amount of exposed surface, and this mostly sheltered in the soil. There are many similar consolidated forms which are not subterranean. Thus plants like the Houseleek (Fig. 91) imitate a bulb. Among Cactuses the columnar species of Cereus (Fig. 111, *b*), may be likened to rootstocks. A green rind serves the purpose of foliage; but the surface is as nothing compared with an ordinary leafy plant of the same bulk. Compare, for instance, the largest Cactus known, the Giant Cereus of the Gila River (Fig. 111, in the background), which rises to the height of fifty or sixty feet, with a common leafy tree of the same height, such as that in Fig. 89, and estimate how vastly greater, even without the foliage, the surface of the latter is than that of the former. Compare, in the

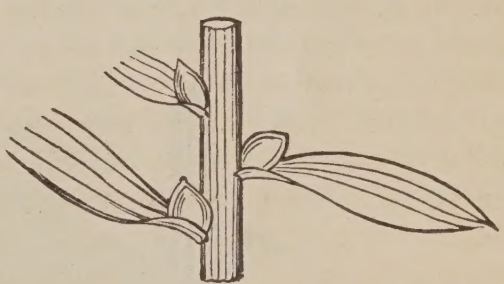

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FIG. 107. Bulb of a wild Lily. 108. The same divided lengthwise, showing two forming buds of the next generation.

FIG. 109. A ground leaf of White Lily, its base (cut across) thickened into a bulb-scale. This plainly shows that bulb-scales are leaves.

FIG. 110. Bulblets in the axils of leaves of a Tiger Lily.

same view, an Opuntia or Prickly-Pear Cactus, its stem and branches formed of a succession of thick and flattened joints (Fig. 111, *a*), which may be likened to tubers, or an Epiphyllum (*d*), having short and flat joints, with an ordinary leafy shrub or herb of equal size. And finally, in Melon-Cactuses, Echinocactus (*c*), or other globose forms (which may be likened to permanent corms), with their globular or bulb-like shapes, we have plants in the compactest shape; their spherical figure being such as to expose the least possible amount of substance to the air. These are adaptations to climates which are very dry, either throughout or for a part of the year. Similarly, bulbous and corm-bearing plants, and the like, are examples of a form of vegetation which in the growing season may expand a large surface to the air and light, while during the period of rest the living vegetable is reduced to a globe, or solid form of the least possible surface; and this protected by its outer coats of dead and dry scales, as well as by its situation under ground. Such are also adapted to a season of drought. They largely belong to countries which have a long hot season of little or no rain, when, their stalks and foliage above and their roots beneath early perishing, the plants rest securely in their compact bulbs, filled with nourishment and retaining their moisture with great tenacity, until the rainy season comes round. Then they shoot forth leaves and flowers with wonderful rapidity, and what was perhaps a desert of arid sand becomes green with foliage and gay with blossoms, almost in a day.

111

Section VII. LEAVES.

118. Stems bear leaves, at definite points (nodes, 13); and these are produced in a great variety of forms, and subserve various uses. The commonest kind of leaf, which therefore may be taken as the type or pattern, is an expanded green body, by means of which the plant exposes to the air and light the matters which it imbibes, exhales certain portions, and assimilates the residue into vegetable matter for its nourishment and growth.

119. But the fact is already familiar (10–30) that leaves occur under other forms and serve for other uses, — for the storage of food already assimilated, as in thickened seed-leaves and bulb-scales; for covering, as in bud-scales; and still other uses are to be pointed out. Indeed, sometimes they are of no service to the plant, being reduced to mere scales or rudiments, such as those on the rootstocks of Peppermint (Fig. 97) or the tubers of Jerusalem Artichoke (Fig. 101). These may be said to be of service only to the botanist, in explaining to him the plan upon which a plant is constructed.

120. Accordingly, just as a rootstock, or a tuber, or a tendril is a kind of stem, so a bud-scale, or a bulb-scale, or a cotyledon, or a petal of a flower, is a kind of leaf. Even in respect to ordinary leaves, it is natural to use the word either in a wider or in a narrower sense; as when in one sense we say that a leaf consists of blade and petiole or leaf-stalk, and in another sense say that a leaf is petioled, or that the leaf of Hepatica is three-lobed. The connection should make it plain whether by leaf we mean leaf-blade only, or the blade with any other parts it may have. And the student will readily understand that by leaf in its largest or *morphological* sense, the botanist means the organ which occupies the place of a leaf, whatever be its form or its function.

§ 1. LEAVES AS FOLIAGE.

121. This is tautological; for foliage is simply leaves: but it is very convenient to speak of typical leaves, or those which serve the plant for assimilation, as foliage-leaves, or ordinary leaves. These may first be considered.

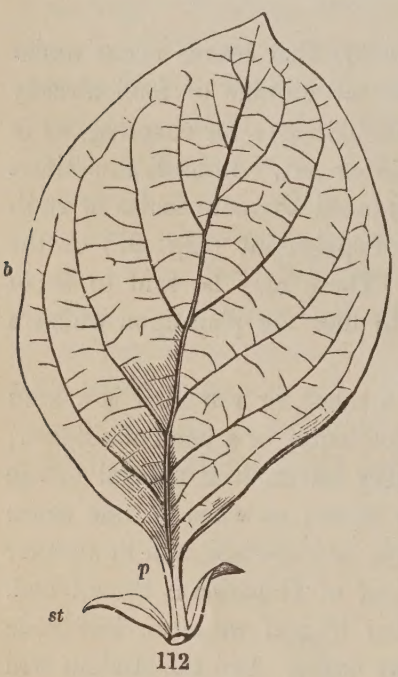
122. **The Parts of a Leaf.** The ordinary leaf, complete in its parts, consists of *blade*, *foot-stalk*, or *petiole*, and a pair of *stipules*.

123. First the Blade or Lamina, which is the essential part of ordinary leaves, that is, of such as serve the purpose of foliage. In structure it consists of a softer part, the *green pulp*, called *parenchyma*, which is traversed and supported by a fibrous frame, the parts of which are called *ribs* or *veins*, on account of a certain likeness in arrangement to the veins of animals.

The whole surface is covered by a transparent skin, the *Epidermis*, not unlike that which covers the surface of all fresh shoots.

124. Note that the leaf-blade expands horizontally, — that is, normally presents its faces one to the sky, the other to the ground, or when the leaf is erect the upper face looks toward the stem that bears it, the lower face away from it. Whenever this is not the case there is something to be explained.

125. The framework consists of *wood*, — a fibrous and tough material which runs from the stem through the leaf-stalk, when there is one, in the form of parallel threads or bundles of fibres; and in the blade these spread out in a horizontal direction, to form the *ribs* and *veins* of the leaf. The stout main branches of the framework are called the *Ribs*. When there is only one, as in Fig. 112, 114, or a middle one decidedly larger than the rest, it is called the *Midrib*. The smaller divisions are termed *Veins;* and their still smaller subdivisions, *Veinlets*. The latter subdivide again and again, until they become so fine that they are invisible to the naked eye. The fibres of which they are composed are hollow; forming tubes by which the sap is brought into the leaves and carried to every part.



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126. Venation is the name of the mode of veining, that is, of the way in which the veins are distributed in the blade. This is of two principal kinds; namely, the *parallel-veined*, and the *netted-veined*.

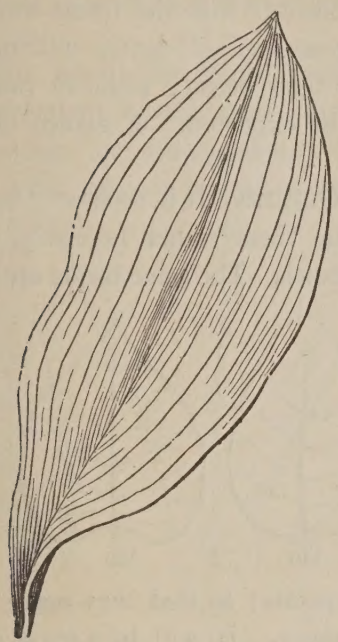
127. In *Netted-veined* (also called *Reticulated*) leaves, the veins branch off from the main rib or ribs, divide into finer and finer veinlets, and the branches unite with each other to form meshes of network. That is, they *anastomose*, as anatomists say of the veins and arteries of the body. The Quince-leaf, in Fig. 112, shows this kind of veining in a leaf with a single rib. The Maple, Basswood, Plane or Buttonwood (Fig. 74) show it in leaves of several ribs.

128. In *parallel-veined* leaves, the whole framework consists of slender ribs or veins, which run parallel with each other, or nearly so, from the base to the point of the leaf, — not dividing and subdividing, nor forming meshes, except by minute cross-veinlets. The leaf of any grass, or that of the Lily of the Valley (Fig. 113) will furnish a good illustration. Such parallel veins Linnaeus called *Nerves*, and parallel-veined leaves are still commonly called *nerved* leaves, while those of the other kind are said to be

FIG. 112. Leaf of the Quince: *b*, blade; *p*, petiole; *st*, stipules.

veined, — terms which it is convenient to use, although these "nerves" and "veins" are all the same thing, and have no likeness to the *nerves* and little to the veins of animals.

129. *Netted-veined* leaves belong to plants which have a pair of seed-leaves or cotyledons, such as the Maple (Fig. 20, 24,), Beech (Fig. 33), and



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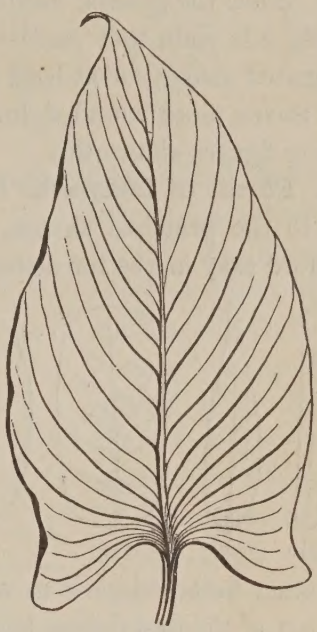


114

the like; while *parallel-veined* or *nerved* leaves belong to plants with one cotyledon or true seed-leaf; such as the Iris (Fig. 59), and Indian Corn (Fig. 70). So that a mere glance at the leaves generally tells what the structure of the embryo is, and refers the plant to one or the other of these two grand classes, — which is a great convenience. For when plants differ from each other in some one important respect, they usually differ correspondingly in other respects also.

130. Parallel-veined leaves are of two sorts, — one kind, and the commonest, having the ribs or nerves all running from the base to the point of the leaf, as in the examples already given; while in another kind they run from a midrib to the margin, as in the common Pickerel-weed of our ponds, in the Banana, in Calla (Fig. 114), and many similar plants of warm climates.

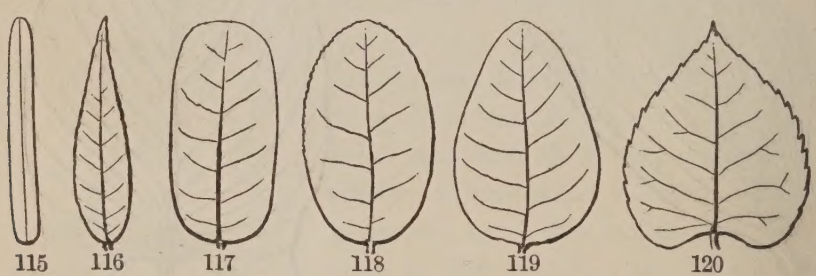
131. Netted-veined leaves are also of two sorts, as in the examples already referred to. In one case the veins all rise from a single rib (the midrib), as in Fig. 112, 116–127. Such leaves are called *Feather-veined* or *Penni-veined*, i. e. *Pinnately-veined;* both terms meaning the same thing, namely, that the veins are arranged on the sides of the rib like the plume of a feather on each side of the shaft.

FIG. 113. A (parallel-veined) leaf of the Lily of the Valley. 114. One of the Calla Lily.

132. In the other case (as in Fig. 74, 129–132), the veins branch off from three, five, seven, or nine ribs, which spread from the top of the leaf-stalk, and run through the blade like the toes of a web-footed bird. Hence these are said to be *Palmately* or *Digitately* veined, or (since the ribs diverge like rays from a centre) *Radiate-veined.*

133. Since the general outline of leaves accords with the frame-work or skeleton, it is plain that *feather-veined* (or *penni-veined*) leaves will incline to elongated shapes, or at least to be longer than broad; while in *radiate-veined* leaves more rounded forms are to be expected. A glance at the following figures shows this.

134. **Forms of Leaves as to General Outline.** It is necessary to give names to the principal shapes, and to define them rather precisely, since they afford easy marks for distinguishing species. The same terms are used



for all other flattened parts as well, such as petals; so that they make up a great part of the descriptive language of Botany. It will be a good exercise for young students to look up leaves answering to these names and definitions. Beginning with the narrower and proceeding to the broadest forms, a leaf is said to be

Linear (Fig. 115), when narrow, several times longer than wide, and of the same breadth throughout.

Lanceolate, or *Lance-shaped*, when conspicuously longer than wide, and tapering upwards (Fig. 116), or both upwards and downwards.

Oblong (Fig. 117), when nearly twice or thrice as long as broad.

Elliptical (Fig. 118) is oblong with a flowing outline, the two ends alike in width.

Oval is the same as broadly elliptical, or elliptical with the breadth considerably more than half the length.

Ovate (Fig. 119), when the outline is like a section of a hen's egg lengthwise, the broader end downward.

Orbicular, or *Rotund* (Fig. 132), circular in outline, or nearly so.

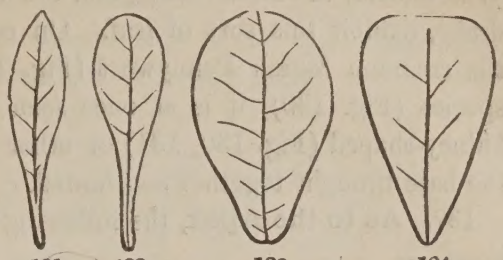
135. A leaf which tapers toward the base instead of toward the apex may be

Oblanceolate (Fig. 121) when of the lance-shaped form, only more tapering toward the base than in the opposite direction.

Spatulate (Fig. 122) when more rounded above, but tapering thence to a narrow base, like an old-fashioned spatula.

FIG. 115–120. A series of shapes of feather-veined leaves.

Obovate (Fig. 123) or inversely ovate, that is, ovate with the narrower end down.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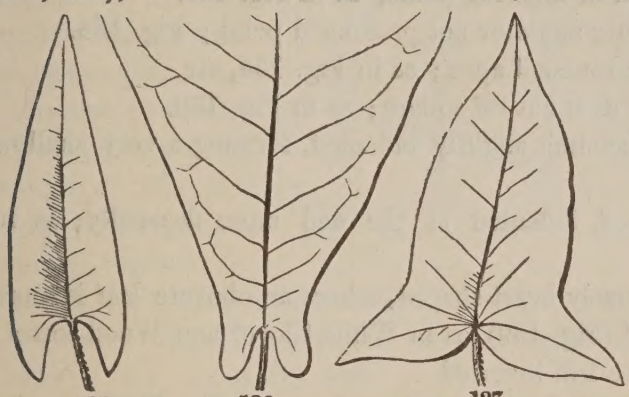
Cuneate or *Cuneiform*, that is, *Wedge-shaped* (Fig. 124), broad above and tapering by nearly straight lines to an acute angle at the base.

136. **As to the Base**, its shape characterizes several forms, such as *Cordate* or *Heart-shaped* (Fig. 120, 129), when a leaf of an ovate form, or something like it, has the outline of its rounded base turned in (forming a notch or *sinus*) where the stalk is attached.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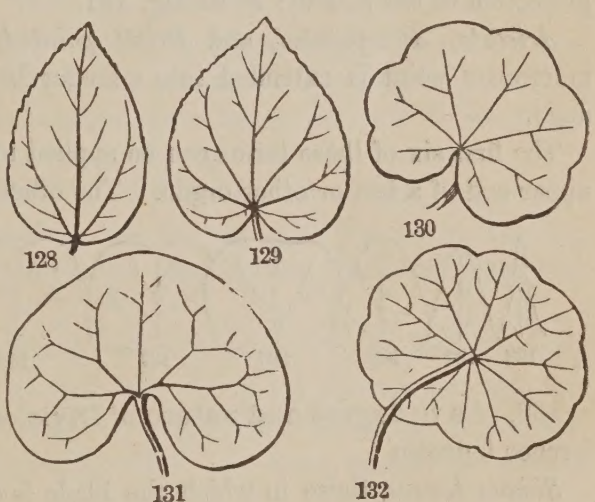
Reniform, or *Kidney-shaped* (Fig. 131), like the last, only rounder and broader than long.

Auriculate, or *Eared*, having a pair of small and blunt projections, or *ears*, at the base, as in one species of Magnolia (Fig. 126).

Sagittate, or *arrow-shaped*, where such ears are acute and turned downwards, while the main body of the blade tapers upwards to a point, as in the common Sagittaria or Arrow-head, and in the Arrow-leaved Polygonum (Fig. 125).


128 129 130 131 132

Hastate, or *Halberd-shaped*, when such lobes at the base point outwards, giving the shape of the halberd of the olden time, as in another Polygonum (Fig. 127).

Peltate, or *Shield-shaped* (Fig. 132), is the name applied to a curious modification of the leaf, commonly of a rounded form, where the footstalk is attached to the lower surface, instead of the base, and therefore is natu-

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FIG. 121, oblanceolate; 122, spatulate; 123, obovate; and 124, wedge-shaped, feather-veined, leaves.

FIG. 125, sagittate; 126, auriculate; and 127, halberd-shaped or hastate leaves.

FIG. 128–132. Various forms of radiate-veined leaves.

rally likened to a shield borne by the outstretched arm. The common Watershield, the Nelumbium, and the White Water-lily, and also the Mandrake, exhibit this sort of leaf. On comparing the shield-shaped leaf of the common Marsh Pennywort (Fig. 132) with that of another common species (Fig. 130), it is at once seen that a shield-shaped leaf is like a kidney-shaped (Fig. 130, 131) or other rounded leaf, with the margins at the base brought together and united.

137. **As to the Apex**, the following terms express the principal variations: —

Acuminate, Pointed, or *Taper-pointed,* when the summit is more or less prolonged into a narrowed or tapering point; as in Fig. 133.

Acute, ending in an acute angle or not prolonged point; Fig. 134.

Obtuse, with a blunt or rounded apex; as in Fig. 135, etc.

Truncate, with the end as if cut off square; as in Fig. 136.

Retuse, with rounded summit slightly indented, forming a very shallow notch, as in Fig. 137.

Emarginate, or *Notched,* indented at the end more decidedly; as in Fig. 138.

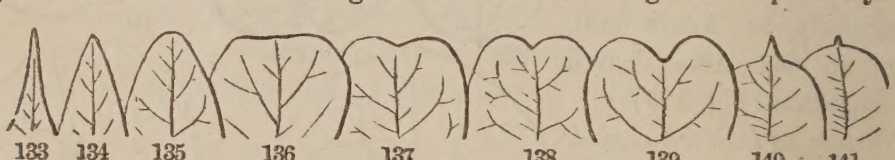
Obcordate, that is, inversely heart-shaped, where an obovate leaf is more deeply notched at the end (Fig. 139), as in White Clover and Wood-sorrel; so as to resemble a cordate leaf inverted.

Cuspidate, tipped with a sharp and rigid point; as in Fig. 140.

Mucronate, abruptly tipped with a small and short point, like a mere projection of the midrib; as in Fig. 141.

Aristate, Awn-pointed, and *Bristle-pointed,* are terms used when this mucronate point is extended into a longer bristle-form or slender appendage.

The first six of these terms can be applied to the lower as well as to the upper end of a leaf or other organ. The others belong to the apex only.



138. **As to degree and nature of Division**, there is first of all the difference between

Simple Leaves, those in which the blade is of one piece, however much it may be cut up, and

Compound Leaves, those in which the blade consists of two or more separate pieces, upon a common leaf-stalk or support. Yet between these two kinds every intermediate gradation is to be met with.

139. **As to Particular Outlines of Simple Leaves** (and the same applies to their separate parts), they are

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FIG. 133–141. Forms of the apex of leaves.

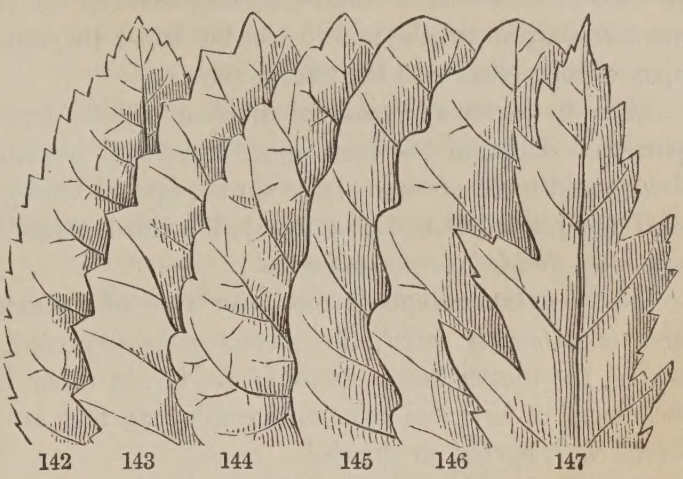
Entire, when their general outline is completely filled out, so that the margin is an even line, without teeth or notches.

Serrate, or *Saw-toothed*, when the margin only is cut into sharp teeth, like those of a saw, and pointing forwards: as in Fig. 142.

Dentate, or *Toothed*, when such teeth point outwards, instead of forwards; as in Fig. 143.

Crenate, or *Scalloped*, when the teeth are broad and rounded; as in Fig. 144.

Repand, Undulate, or *Wavy*, when the margin of the leaf forms a wavy line, bending slightly inwards and outwards in succession; as in Fig. 145.



142 143 144 145 146 147

Sinuate, when the margin is more strongly sinuous or turned inwards and outwards; as in Fig. 146.

Incised, Cut, or *Jagged*, when the margin is cut into sharp, deep, and irregular teeth or incisions; as in Fig. 147.

Lobed, when deeply cut. Then the pieces are in a general way called Lobes. The number of the lobes is briefly expressed by the phrase *two-lobed, three-lobed, five-lobed, many-lobed*, etc., as the case may be.

140. When the depth and character of the lobing needs to be more particularly specified, the following terms are employed, viz.: —

Lobed, in a special sense, when the incisions do not extend deeper than about half-way between the margin and the centre of the blade, if so far, and are more or less rounded; as in the leaves of the Post-Oak, Fig. 148, and the Hepatica, Fig. 152.

Cleft, when the incisions extend half way down or more, and especially when they are sharp; as in Fig. 149, 153. And the phrases *two-cleft*, or, in the Latin form, *bifid, three-cleft* or *trifid, four-cleft* or *quadrifid, five-cleft* or *quinquefid*, etc., or *many-cleft*, in the Latin form, *multifid*, — express the number of the *Segments*, or portions.

Parted, when the incisions are still deeper, but yet do not quite reach to the midrib or the base of the blade; as in Fig. 150, 154. And the terms *two-parted, three-parted*, etc., express the number of such divisions.

Divided, when the incisions extend quite to the midrib, as in the lower part of Fig. 151, or to the leaf-stalk, as in Fig. 155; which really makes the

Fig. 142–147. Kinds of margin of leaves.

leaf compound. Here, using the Latin form, the leaf is said to be *bisected, trisected* (Fig. 155), etc., according to the number of the divisions.

141. **The Mode of Lobing or Division** corresponds to that of the veining, whether *pinnately veined* or *palmately veined.* In the former the notches or incisions, or *sinuses*, coming between the principal veins or ribs are directed toward the midrib: in the latter they are directed toward the apex of the petiole; as the figures show.

142. So degree and mode of division may be tersely expressed in brief phrases. Thus, in the four upper figures of pinnately veined leaves, the first is said to be *pinnately lobed* (in the special sense), the second *pinnately cleft* (or *pinnatifid* in Latin form), the third *pinnately parted*, the fourth *pinnately divided*, or *pinnatisected.*

143. Correspondingly in the lower row, of palmately veined leaves, the first is *palmately lobed*, the second *palmately cleft*, the third *palmately parted*, the fourth *palmately divided.* Or, in other language of the same meaning (but now less commonly employed), they are said to be *digitately lobed, cleft, parted*, or *divided.*

144. The number of the divisions or lobes may come into the phrase. Thus in the four last named figures the leaves are respectively *palmately*

three-lobed, three-cleft (or *trifid*), *three-parted, three-divided*, or better (in Latin form), *trisected.* And so for higher numbers, as *five-lobed, five-cleft,*

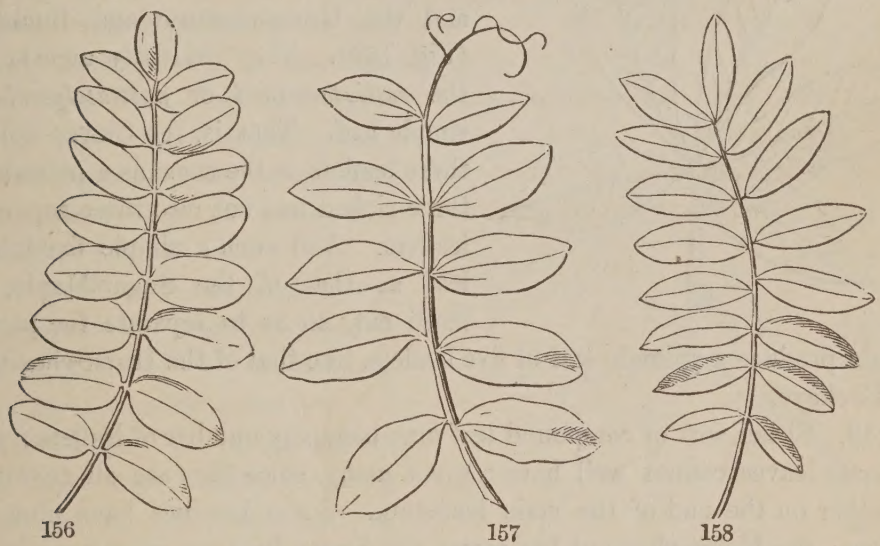
FIG. 148, pinnately lobed; 149, pinnately cleft; 150, pinnately parted; 151, pinnately divided, leaves.

FIG. 152, palmately three-lobed; 153, palmately three-cleft; 154, palmately three-parted; 155, palmately three-divided or trisected, leaves.

etc., up to *many-lobed*, *many-cleft* or *multifid*, etc. The same mode of expression may be used for pinnately lobed leaves, as *pinnately 7-lobed*, *-cleft*, *-parted*, etc.

145. The divisions, lobes, etc., may themselves be *entire* (without teeth or notches), or *serrate*, or otherwise toothed or incised; or lobed, cleft, parted, etc.: in the latter cases making *twice pinnatifid*, *twice palmately* or *pinnately lobed*, *parted*, or *divided* leaves, etc. From these illustrations one will perceive how the botanist, in two or three words, may describe any one of the almost endlessly diversified shapes of leaves, so as to give a clear and definite idea of it.

146. **Compound Leaves.** A compound leaf is one which has its blade in entirely separate parts, each usually with a stalklet of its own; and the stalklet is often *jointed* (or *articulated*) with the main leaf-stalk, just as this



156 157 158

is jointed with the stem. When this is the case, there is no doubt that the leaf is compound. But when the pieces have no stalklets, and are not jointed with the main leaf-stalk, it may be considered either as a divided simple leaf, or a compound leaf, according to the circumstances. This is a matter of names where all intermediate forms may be expected.

147. While the pieces or projecting parts of a simple leaf-blade are called *Lobes*, or in deeply cut leaves, etc., *Segments*, or *Divisions*, the separate pieces or blades of a compound leaf are called LEAFLETS.

148. Compound leaves are of two principal kinds, namely, the *Pinnate* and the *Palmate;* answering to the two modes of veining in reticulated leaves. and to the two sorts of lobed or divided leaves (141).

149. *Pinnate* leaves are those in which the leaflets are arranged on the sides of a main leaf-stalk; as in Fig. 156–158. They answer to the

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FIG. 156–158. Pinnate leaves, the first with an odd leaflet (*odd-pinnate*); the second with a tendril in place of uppermost leaflets; the third *abruptly pinnate*, or of even pairs.

feather-veined (i. e. *pinnately-veined*) simple leaf; as will be seen at once on comparing the forms. The *leaflets* of the former answer to the *lobes* or *divisions* of the latter; and the continuation of the petiole, along which the leaflets are arranged, answers to the midrib of the simple leaf.

150. Three sorts of pinnate leaves are here given. Fig. 156 is *pinnate with an odd* or *end leaflet*, as in the Common Locust and the Ash. Fig. 157 is *pinnate with a tendril at the end*, in place of the odd leaflet, as in the Vetches and the Pea. Fig. 158 is evenly or *abruptly pinnate*, as in the Honey-Locust.

151. *Palmate* (also named *Digitate*) leaves are those in which the leaflets are all borne on the tip of the leaf-stalk, as in the Lupine, the Common Clover, the Virginia Creeper (Fig. 93), and the Horse-chestnut and Buckeye (Fig. 159). They evidently answer to the *radiate-veined* or *palmately-veined* simple leaf. That is, the Clover-leaf of three leaflets is the same as a palmately three-ribbed leaf cut into three separate leaflets. And such a simple five-lobed leaf as that of the Sugar-Maple, if more cut, so as to separate the parts, would produce a palmate leaf of five leaflets, like that of the Horse-chestnut or Buckeye.

159

152. Either sort of compound leaf may have any number of leaflets; yet palmate leaves cannot well have a great many, since they are all crowded together on the end of the main leaf-stalk. Some Lupines have nine or eleven; the Horse-chestnut has seven, the Sweet Buckeye more commonly five, the Clover three. A pinnate leaf often has only seven or five leaflets, or only three, as in Beans of the genus Phaseolus, etc.; in some rarer cases only two; in the Orange and Lemon and also in the common Barberry there is only one! The joint at the place where the leaflet is united with the petiole distinguishes this last case from a simple leaf. In other species of these genera the lateral leaflets also are present.

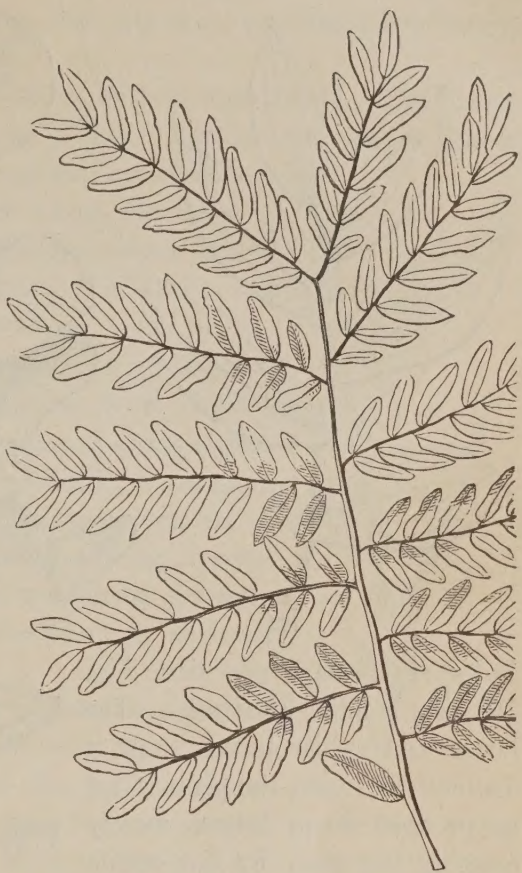
153. The leaflets of a compound leaf may be either *entire* (as in Fig. 126–128), or *serrate*, or lobed, cleft, parted, etc.; in fact, may present all the variations of simple leaves, and the same terms equally apply to them.

154. When the division is carried so far as to separate what would be one leaflet into two, three, or several, the leaf becomes *doubly* or *twice compound*, either *pinnately* or *palmately*, as the case may be. For example, while the clustered leaves of the Honey-Locust are *simply pinnate*, that is, *once pinnate*, those on new shoots are *bipinnate*, or *twice pinnate*, as in Fig. 160. When these leaflets are again divided in the same way, the leaf

FIG. 159. Palmate (or digitate) leaf of five leaflets, of the Sweet Buckeye.

becomes *thrice pinnate*, or *tripinnate*, as in many Acacias. The first divisions are called *Pinnæ;* the others, *Pinnules;* and the last, or little blades themselves, *Leaflets*.

155. So the palmate leaf, if again compounded in the same way, becomes *twice palmate*, or, as we say when the divisions are in threes, *twice ternate* (in Latin form *biternate*); if a third time compounded, *thrice ternate* or *triternate*. But if the division goes still further, or if the degree is variable, we simply say that the leaf is *decompound;* either palmately or pinnately decompound, as the case may be. Thus, Fig. 161 represents a four times ternately compound (in other words a *ternately decompound*) leaf of a common Meadow Rue.



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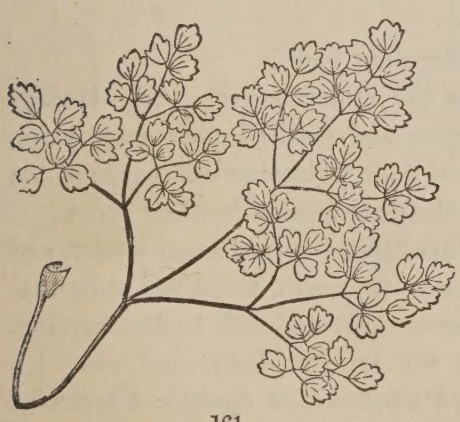
156. When the botanist, in describing leaves, wishes to express the number of the leaflets, he may use terms like these: —

Unifoliolate, for a compound leaf of a single leaflet; from the Latin *unum*, one, and *foliolum*, leaflet.

Bifoliolate, of two leaflets, from the Latin *bis*, twice, and *foliolum*, leaflet.



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Trifoliolate (or *ternate*), of three leaflets, as the Clover; and so on.

Palmately bifoliolate, trifoliolate, quadrifoliate, plurifoliolate (of several leaflets), etc.: or else

Pinnately bi-, tri-, quadri-, or *plurifoliolate* (that is, of two, three, four, five, or several leaflets), as the case may be: these are terse ways of denoting in single phrases both the number of leaflets and the kind of compounding.

157. Of foliage-leaves having certain peculiarities in structure, the following may be noted: —

FIG. 160. A twice-pinnate (abruptly) leaf of the Honey-Locust.
FIG. 161. Ternately decompound leaf of Meadow Rue.

158. **Perfoliate Leaves.** In these the stem that bears them seems to run through the blade of the leaf, more or less above its base. A common

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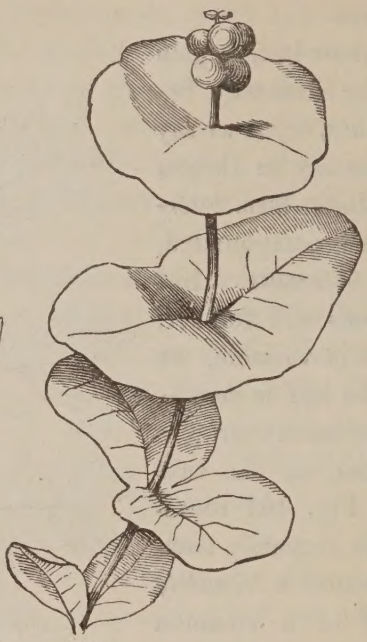

163

Bellwort (Uvularia perfoliata, Fig. 162) is a familiar illustration. The lower and earlier leaves show it distinctly. Later, the plant is apt to produce some leaves merely clasping the stem by the sessile and heart-shaped base, and the latest may be merely sessile. So the series explains the peculiarity: in the formation of the leaf the bases, meeting around the stem, grow together there.

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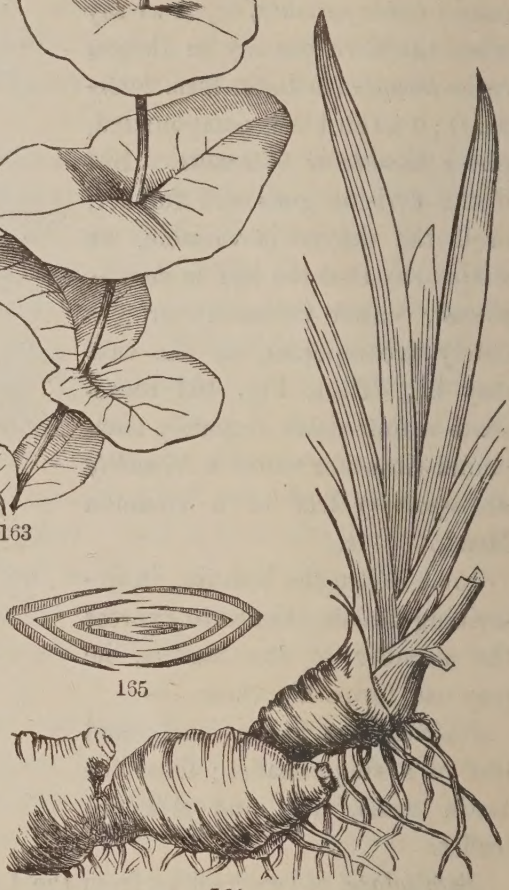

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159. **Connate-perfoliate.** Such are the upper leaves of true Honeysuckles. Here (Fig. 163) of the opposite and sessile leaves, some pairs, especially the uppermost, in the course of their formation unite around the stem, which thus seems to run through the disk formed by their union.

160. **Equitant Leaves.** While ordinary leaves spread horizontally, and present one face to the sky and the other to the earth, there are some that present their tip to the sky, and their faces right and left to the horizon. Among these are the *equitant* leaves of the Iris or Flower-de-Luce. Inspection shows that each leaf was formed as if *folded together lengthwise*,

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Fig. 162. A summer branch of Uvularia perfoliata; lower leaves perfoliate, upper cordate-clasping, uppermost simply sessile.

Fig. 163. Branch of a Honeysuckle, with connate-perfoliate leaves.

Fig. 164. Rootstock and equitant leaves of Iris. 165. A section across the cluster of leaves at the bottom, showing the equitation.

so that what would be the upper surface is within, and all grown together, except next the bottom, where each leaf covers the next younger one. It was from their straddling over each other, like a man on horseback (as is seen in the cross-section, Fig. 165), that Linnæus, with his lively fancy, called these *Equitant* leaves.

161. **Leaves with no distinction of Petiole and Blade.** The leaves of Iris just mentioned show one form of this. The flat but narrow leaves of Jonquils, Daffodils, and the cylindrical leaf of Onions are other instances. *Needle-shaped* leaves, like those of the Pine, Larch, and Spruce, and the *awl-shaped* as well as the *scale-shaped* leaves of Junipers, Red Cedar, and Arbor-Vitæ (Fig. 166), are examples.

166

162. **Phyllodia.** Sometimes an expanded *petiole* takes the place of the blade; as in numerous New Holland Acacias, some of which are now common in greenhouses. Such counterfeit blades are called *phyllodia*, — meaning leaf-like bodies. They may be known from true blades by their standing edgewise, their margins being directed upwards and downwards; while in true blades the faces look upwards and downwards; excepting in equitant leaves, as already explained.

163. **Falsely Vertical Leaves.** These are apparent exceptions to the rule, the blade standing edgewise instead of flatwise to the stem; but this position comes by a twist of the stalk or the base of the blade. Such leaves present the two faces about equally to the light. The Compass-plant (Silphium laciniatum) is an example. So also the leaves of Boltonia, of Wild Lettuce, and of a vast number of Australian Myrtaceous shrubs and trees, which much resemble the phyllodia of the Acacias of the same country. They are familiar in Callistemon, the Bottle-brush Flower, and in Eucalyptus. But in the latter the leaves of the young tree have the normal structure and position.

167 168

164. **Cladophylla**, meaning *branch-leaves*. The foliage of Ruscus (the Butcher's Broom of Europe) and of Myrsiphyllum of South Africa (cultivated for decoration under the false

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Fig. 166. Branch of Arbor-Vitæ, with awl-shaped and scale-shaped leaves.
Fig. 167. The ambiguous leaf? (cladophyllum) of Myrsiphyllum.
Fig. 168. Same of Ruscus, or Butcher's Broom.

name of Smilax) is peculiar and puzzling. If these blades (Fig. 167, 168) are really leaves, they are most anomalous in occupying the axil of another leaf, reduced to a little scale. Yet they have an upper and lower face, as leaves should, although they soon twist, so as to stand more or less edgewise. If they are branches which have assumed exactly the form and office of leaves, they are equally extraordinary in not making any further development. But in Ruscus, flowers are borne on one face, in the axil of a little scale: and this would seem to settle that they are branches. In Asparagus just the same things as to position are thread-shaped and branch-like.

§ 2. LEAVES OF SPECIAL CONFORMATION AND USE.

165. **Leaves for Storage.** A leaf may at the same time serve both ordinary and special uses. Thus in those leaves of Lilies, such as the common White Lily, which spring from the bulb, the upper and green part serves for foliage and elaborates nourishment, while the thickened portion or bud-scale beneath serves for the storage of this nourishment. The thread-shaped leaf of the Onion fulfils the same office, and the nourishing matter it prepares is deposited in its sheathing base, forming one of the concentric layers of the onion. When these layers, so thick and succulent, have given up their store to the growing parts within, they are left as thin and dry husks. In a Houseleek, an Aloe or an Agave, the green color of the surface of the fleshy leaf indicates that it is doing the work of foliage; the deeper-seated white portion within is the storehouse of the nourishment which the green surface has elaborated. So, also, the seed-leaves or cotyledons are commonly used for storage. Some, as in one of the Maples, the Pea, Horse-chestnut, Oak, etc., are for nothing else. Others, as in Beech and in our common

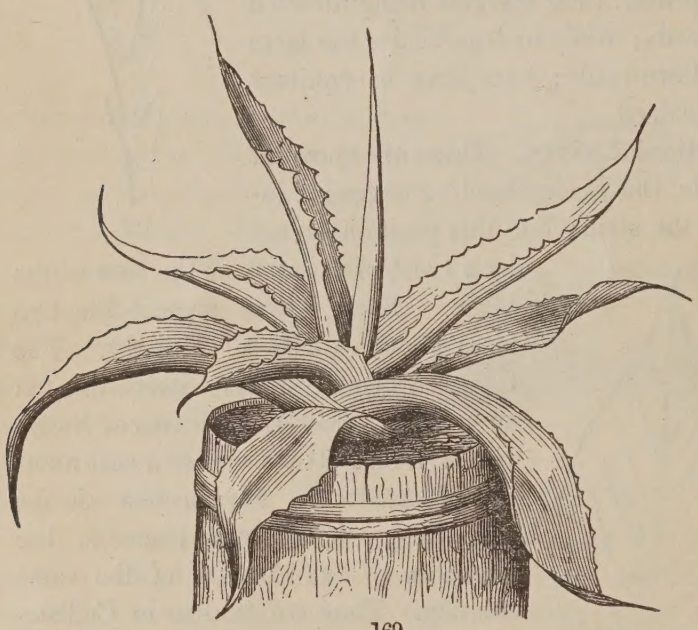

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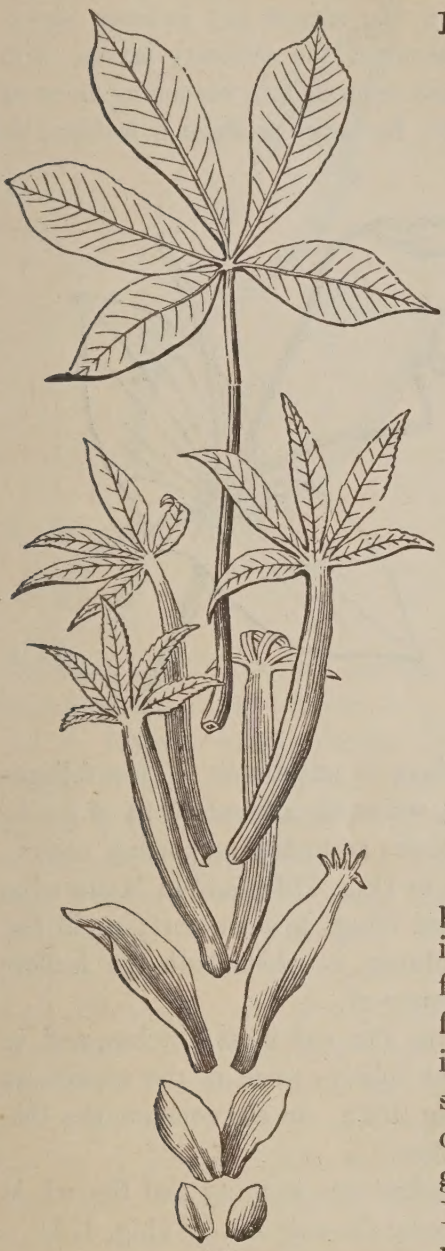
FIG. 169. A young Agave Americana, or Century-plant; fleshy-leaved.

Beans, give faint indications of service as foliage also, chiefly in vain. Still others, as in the Pumpkin and Flax, having served for storage, develop into the first efficient foliage. Compare 11, 22–30, and the accompanying figures.



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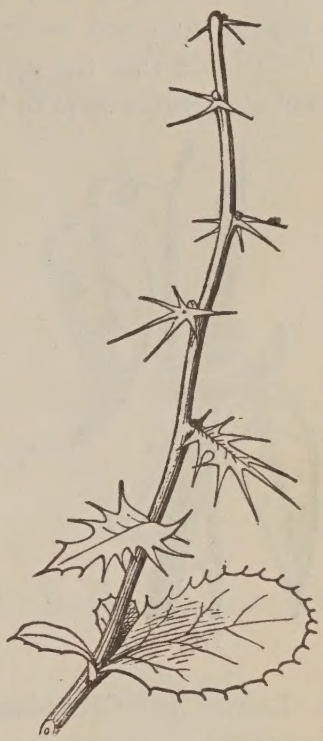

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166. **Leaves as Bud-Scales** serve to protect the forming parts within. Having fulfilled this purpose they commonly fall off when the shoot develops and foliage-leaves appear. Occasionally, as in Fig. 170, there is a transition of bud-scales to leaves, which reveals the nature of the former. The Lilac also shows a gradation from bud-scale to simple leaf. In Cornus florida (the Flowering Dogwood), the four bud-scales which through the winter protect the head of forming flowers remain until blossoming, and then the base of each grows out into

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FIG. 170. Series of bud-scales and foliage-leaves from a developing bud of the Low Sweet Buckeye (Æsculus parviflora), showing nearly complete gradation, from a scale to a compound leaf of five leaflets; and that the scales answer to reduced petioles.

FIG. 171. Shoot of common Barberry, showing transition of foliage-leaves to spines.

a large and very showy petal-like leaf; the original dry scale is apparent in the notch at the apex.

167. **Leaves as Spines** occur in several plants. A familiar instance is that of the common Barberry (Fig. 171). In almost any summer shoot, most of the gradations may be seen between the ordinary leaves, with sharp bristly teeth, and leaves which are reduced to a branching spine or thorn. The fact that the spines of the Barberry produce a leaf-bud in their axil also proves them to be leaves.

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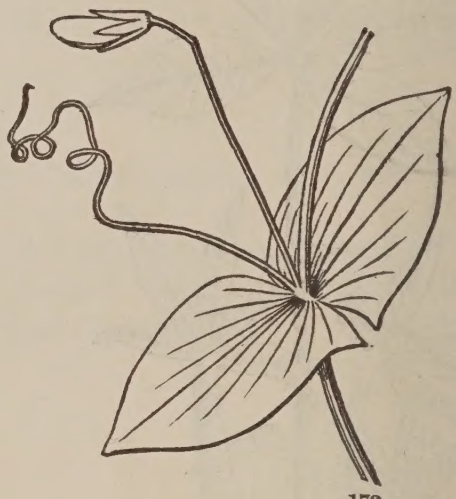

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168. **Leaves for Climbing** are various in adaptation. True foliage-leaves serve this purpose; as in Gloriosa, where the attenuated tip of a simple leaf (otherwise like that of a Lily) hooks around a supporting object; or in Solanum jasminoides of the gardens (Fig. 172), and in Maurandia, etc., where the leaf-stalk coils round and clings to a support; or in the compound leaves of Clematis and of Adlumia, in which both the leaflets and their stalks hook or coil around the support.

169. Or in a compound leaf, as in the Pea and most Vetches, and in Cobæa, while the lower leaflets serve for foliage, some of the uppermost are developed as tendrils for climbing (Fig. 167). In the common Pea this is so with all but one or two pairs of leaflets.

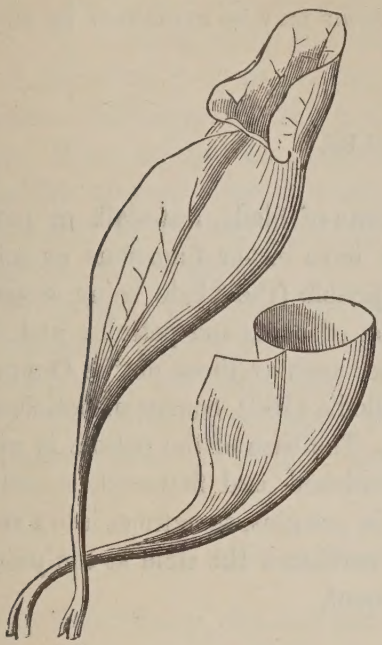
170. In one European Vetch, the leaflets are wanting and the whole petiole is a tendril, while the stipules become the only foliage (Fig. 173).

171. **Leaves as Pitchers**, or hollow tubes, are familiar in the common Pitcher-plant or Side-saddle Flower (Sarracenia, Fig. 174) of our bogs. These pitchers are generally half full of water, in which flies and other insects are drowned, often in such numbers as to make a rich manure for the plant. More curious are some of the southern species of Sarracenia, which seem to be specially adapted to the capture and destruction of flies and other insects.

FIG. 172. Leaves of Solanum jasminoides, the petiole adapted for climbing.

FIG. 173. Leaf of Lathyrus Aphaca, consisting of a pair of stipules and a tendril.

172. The leaf of Nepenthes (Fig. 175) combines three structures and uses. The expanded part below is foliage: this tapers into a tendril for



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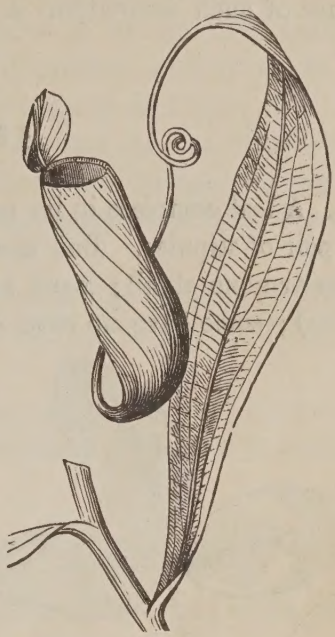

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climbing; and this bears a pitcher with a lid. Insects are caught, and perhaps digested, in the pitcher.

173. **Leaves as Fly-traps.** Insects are caught in another way, and more expertly, by the most extraordinary of all the plants of this country, the Dionæa or Venus's Fly-trap, which grows in the sandy bogs around Wilmington, North Carolina. Here (Fig. 176) each leaf bears at its summit an appendage which opens and shuts, in shape something like a steel-trap, and operating much like one. For when open, no sooner does a fly alight on its surface, and brush against any one of the two or three bristles that grow there, than the trap suddenly closes, capturing the intruder. If the fly escapes, the trap soon slowly opens, and is ready for another capture. When retained, the insect is after a time moistened by a secretion from minute glands of the inner surface, and is digested. In the various species of Drosera or Sundew, insects are caught

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FIG. 174. Leaf of Sarracenia purpurea, entire, and another with the upper part cut off.

FIG. 175. Leaf of Nepenthes; foliage, tendril, and pitcher combined.

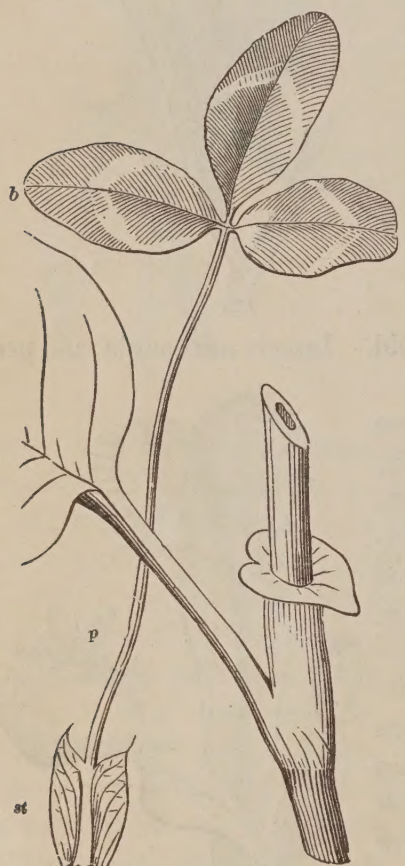
FIG. 176. Leaves of Dionæa; the trap in one of them open, in the others closed.

by sticking fast to very viscid glands at the tip of strong bristles, aided by adjacent gland-tipped bristles which bend slowly toward the captive. The use of such adaptations and operations may be explained in another place.

§ 3. STIPULES.

174. A leaf complete in its parts consists of blade, leaf-stalk or petiole, and a pair of stipules. But most leaves have either fugacious or minute stipules or none at all; many have no petiole (the blade being *sessile* or stalkless); some have no clear distinction of blade and petiole; and many of these, such as those of the Onion and all phyllodia (166), consist of petiole only

175. The base of the petiole is apt to be broadened and flattened, sometimes into thin margins, sometimes into a sheath which embraces the stem at the point of attachment.



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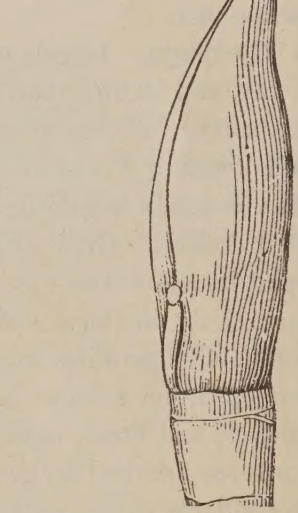

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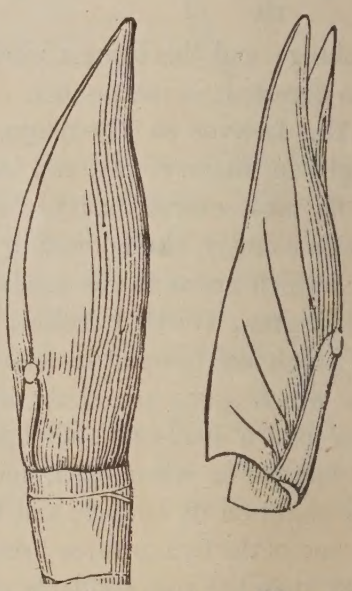

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176. **Stipules** are such appendages, either wholly or partly separated from the petiole. When quite separate they are said to be *free*, as in Fig. 112. When attached to the base of the petiole, as in the Rose and in

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FIG. 177. Leaf of Red Clover: *st*, stipules, adhering to the base of *p*, the petiole; *b*, blade of three leaflets.

FIG. 178. Part of stem and leaf of Prince's-Feather (Polygonum orientale) with the united sheathing stipules forming a sheath or *ocrea*.

FIG. 179. Terminal winter bud of Magnolia Umbrella, natural size. 180. Outermost bud-scale (pair of stipules) detached.

Clover (Fig. 177), they are *adnate*. When the two stipules unite and sheathe the stem above the insertion, as in Polygonum (Fig. 178), this sheath is called an *Ocrea*, from its likeness to a greave or leggin.

177. In Grasses, when the sheathing base of the leaf may answer to petiole, the summit of the sheath commonly projects as a thin and short membrane, like an ocrea: this is called a LIGULA or LIGULE.

178. When stipules are green and leaf-like they act as so much foliage. In the Pea they make up no small part of the actual foliage. In a related plant (Lathyrus Aphaca, Fig. 173), they make the whole of it, the remainder of the leaf being tendril.

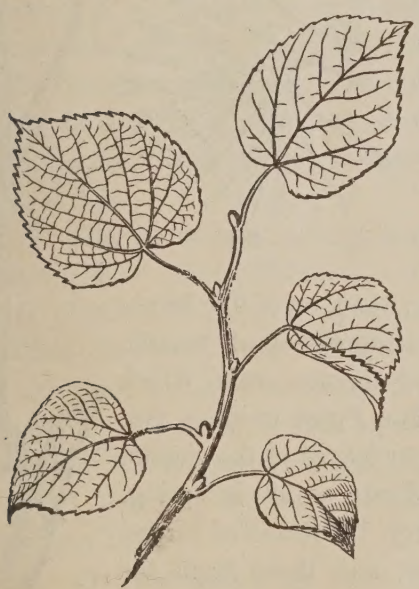
179. In many trees the stipules are the bud-scales, as in the Beech, and very conspicuously in the Fig-tree, Tulip-tree, and Magnolia (Fig. 179). These fall off as the leaves unfold.

180. The stipules are spines or prickles in Locust and several other Leguminous trees and shrubs; they are tendrils in Smilax or Greenbrier.

§ 4. THE ARRANGEMENT OF LEAVES.

181. **Phyllotaxy**, meaning leaf-arrangement, is the study of the position of leaves, or parts answering to leaves, upon the stem.

182. The technical name for the attachment of leaves to the stem is



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the *insertion*. Leaves (as already noticed, 54) are *inserted* in three modes. They are

Alternate (Fig. 181), that is, one after another, or in other words, with only a single leaf to each node;

FIG. 181. Alternate leaves, in Linden, Lime-tree, or Basswood.
FIG. 182. Opposite leaves, in Red Maple.

Opposite (Fig. 182), when there is a pair to each node, the two leaves in this case being always on opposite sides of the stem;

Whorled or *Verticillate* (Fig. 183) when there are more than two leaves on a node, in which case they divide the circle equally between them, forming a *Verticel* or whorl. When there are three leaves in the whorl, the leaves are one third of the circumference apart; when four, one quarter, and so on. So the plan of opposite leaves, which is very common, is merely that of whorled leaves, with the fewest leaves to the whorl, namely, two.

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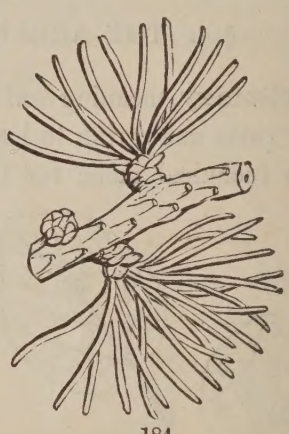
183. In both modes and in all their modifications, the arrangement is such as to distribute the leaves systematically and in a way to give them a good exposure to the light.

184. No two or more leaves ever grow from the same point. The so-called *Fascicled* or *Clustered* leaves are the leaves of a branch the nodes of which are very close, just as they are in the bud, so keeping the leaves in a cluster. This is evident in the Larch (Fig. 184), in which examination shows each cluster to be made up of numerous leaves crowded on a spur or short axis. In spring there are only such clusters; but in summer some of them lengthen into ordinary shoots with scattered alternate leaves. So, likewise, each cluster of two or three needle-shaped leaves in Pitch Pines (as in Fig. 185), or of five leaves in White Pine, answers to a similar extremely short branch, springing from the axil of a thin and slender scale, which represents a leaf of the main shoot. For Pines produce two kinds of leaves, — 1. primary, the proper leaves of the shoots, not as foliage, but in the shape of delicate scales in spring, which soon fall away; and 2. secondary, the *fascicled* leaves, from buds in the axils of the former, and these form the actual foliage.



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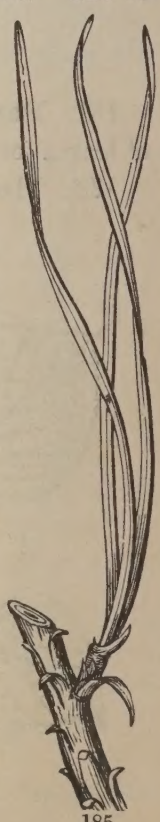

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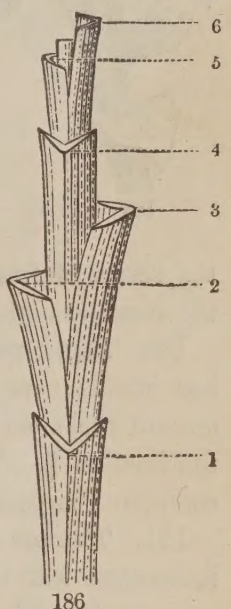
Fig. 183. Whorled leaves of Galium.

Fig. 184. A piece of stem of Larch with two clusters (fascicles) of numerous leaves.

Fig. 185. Piece of a branch of Pitch Pine, with three leaves in a fascicle or bundle, in the axil of a thin scale which answers to a primary leaf. The bundle is surrounded at the base by a short sheath, formed of the delicate scales of the axillary bud.

185. **Phyllotaxy of Alternate Leaves.** Alternate leaves are distributed along the stem in an order which is uniform for each species. The arrangement in all its modifications is said to be *spiral*, because, if we draw a line from the *insertion* (i. e. the point of attachment) of one leaf to that of the next, and so on, this line will wind spirally around the stem as it rises, and in the same species will always bear the same number of leaves for each turn round the stem. That is, any two successive leaves will always be separated from each other by an equal portion of the circumference of the stem. The distance in *height* between any two leaves may vary greatly, even on the same shoot, for that depends upon the length of the *internodes*, or spaces between the leaves; but the distance as measured around the circumference (in other words, the *Angular Divergence*, or angle formed by any two successive leaves) is uniformly the same.

186. **Two-ranked.** The greatest possible divergence is, of course, where the second leaf stands on exactly the opposite side of the stem from the first, the third on the side opposite the second, and therefore over the first, and the fourth over the second. This brings all the leaves into two ranks, one on one side of the stem and one on the other, and is therefore called the *Two-ranked* arrangement. It occurs in all Grasses, — in Indian Corn, for instance; also, in the Basswood (Fig. 181). This is the simplest of all arrangements, and the one which most widely distributes successive leaves, but which therefore gives the fewest vertical ranks. Next is the



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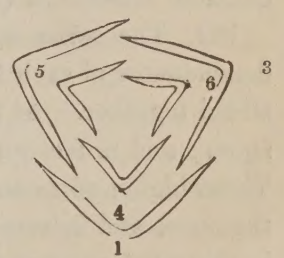
187. **Three-ranked** arrangement, — that of all Sedges, and of White Hellebore. Here the second leaf is placed one third of the way round the stem, the third leaf two thirds of the way round, the fourth leaf accordingly directly over the first, the fifth over the second, and so on. That is, three leaves occur in each turn round the stem, and they are separated from each other by one third of the circumference. (Fig. 186, 187.)



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188. **Five-ranked** is the next in the series, and the most common. It is seen in the Apple (Fig. 188), Cherry, Poplar, and the greater number of trees and shrubs. In this case the line traced from leaf to leaf will pass twice round the stem before it reaches a leaf

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FIG. 186. Two-ranked arrangement, shown in a piece of the stalk of a Sedge, with the leaves cut off above their bases; the leaves are numbered in order, from 1 to 6. 187. Diagram or cross-section of the same, in one plane; the leaves similarly numbered; showing two cycles of three.

situated directly over any below (Fig. 189). Here the sixth leaf is over the first; the leaves stand in five perpendicular ranks, with equal angular distance from each other; and this distance between any two successive leaves is just two fifths of the circumference of the stem.

189. The five-ranked arrangement is expressed by the fraction $\frac{2}{5}$. This fraction denotes the divergence of the successive leaves, i. e. the angle they form with each other: the numerator also expresses the number of turns made round the stem by the spiral line in completing one cycle or set of leaves, namely, two; and the denominator gives the number of leaves in each cycle, or the number of perpendicular ranks, namely, five. In the same way the fraction $\frac{1}{2}$ stands for the two-ranked mode, and $\frac{1}{3}$ for the three-ranked: and so these different sorts are expressed by the series of fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$. Other cases follow in the same numerical progression, the next being the

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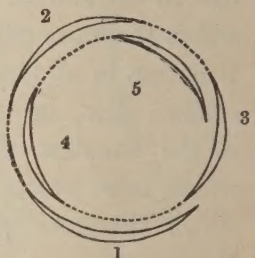

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190. **Eight-ranked** arrangement. In this the ninth leaf stands over the first, and three turns are made around the stem to reach it; so it is expressed by the fraction $\frac{3}{8}$. This is seen in the Holly, and in the common Plantain. Then comes the

191. **Thirteen-ranked** arrangement, in which the fourteenth leaf is over the first, after five turns around the stem. The common Houseleek (Fig. 191) is a good example.

192. The series so far, then, is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, $\frac{3}{8}$, $\frac{5}{13}$; the numerator and the denominator of each fraction being those of the two next preceding ones added together. At this rate the next higher should be $\frac{8}{21}$, then $\frac{13}{34}$, and so on; and in fact just such cases are met with, and (commonly) no others. These higher sorts are found in the Pine Family, both in the leaves and the cones and in many other plants with small and crowded leaves. But in those the number of the ranks, or of leaves in each cycle, can only rarely

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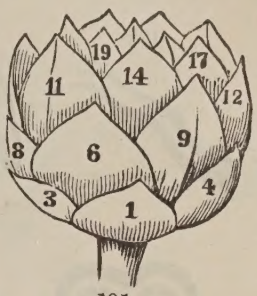
FIG. 188. Shoot with its leaves 5-ranked, the sixth leaf over the first; as in the Apple-tree.

FIG. 189. Diagram of this arrangement, with a spiral line drawn from the attachment of one leaf to the next, and so on; the parts on the side turned from the eye are fainter.

FIG. 190. A ground-plan of the same; the section of the leaves similarly numbered; a dotted line drawn from the edge of one leaf to that of the next marks out the spiral.

be made out by direct inspection. They may be indirectly ascertained, however, by studying the *secondary* spirals, as they are called, which usually become conspicuous, at least two series of them, one turning to the right and one to the left, as shown in Fig. 191. For an account of the way in which the character of the phyllotaxy may be deduced from the secondary spirals, see Structural Botany, Chapter IV.



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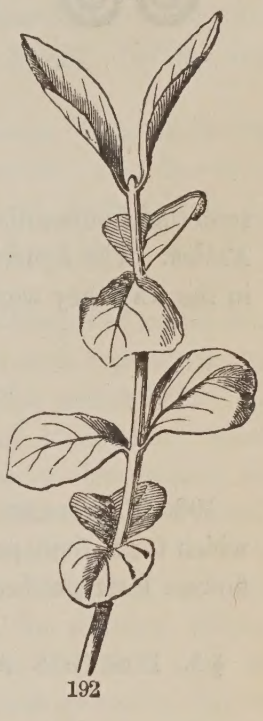
193. **Phyllotaxy of Opposite and whorled Leaves.** This is simple and comparatively uniform. The leaves of each pair or whorl are placed over the intervals between those of the preceding, and therefore under the intervals of the pair or whorl next above. The whorls or pairs alternate or cross each other, usually at right angles, that is, they *decussate.* Opposite leaves, that is, whorls of two leaves only, are far commoner than whorls of three or four or more members. This arrangement in successive decussating pairs gives an advantageous distribution on the stem in four vertical ranks. Whorls of three give six vertical ranks, and so on. Note that in descriptive botany leaves in whorls of two are simply called *opposite* leaves; and that the term *verticillate* or *whorled,* is employed only for cases of more than two, unless the latter number is specified.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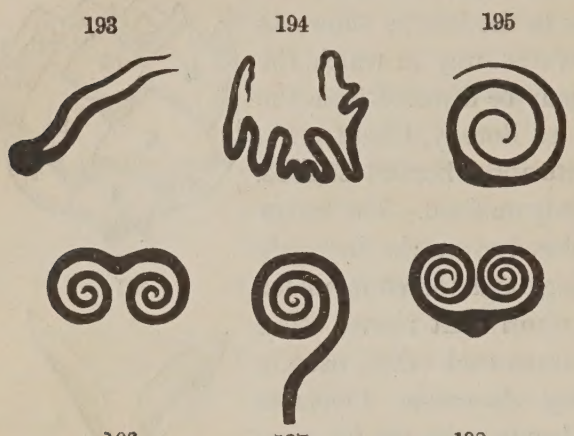
194. **Vernation or Præfoliation,** the disposition of the leaf-blades in the bud, comprises two things; 1st, the way in which each separate leaf is folded, coiled, or packed up in the bud; and 2d, the arrangement of the leaves in the bud with respect to one another. The latter of course depends very much upon the phyllotaxy, i. e. the position and order of the leaves upon the stem. The same terms are used for it as for the arrangement of the leaves of the flower in the flower-bud. See, therefore, "Æstivation, or Præfloration."

195. As to each leaf separately, it is sometimes *straight* and open in vernation, but more commonly it is either *bent, folded,* or *rolled up.* When the upper part is bent down upon the lower, as the young blade in the Tulip-tree is bent upon the leafstalk, it is said to be *Inflexed* or *Reclined* in vernation. When folded by the midrib so that the two halves are placed face to face, it is *Conduplicate* (Fig. 193), as in the Magnolia, the Cherry, and the Oak. When folded back and forth like the plaits of a fan, it is

FIG. 191. A young plant of the Houseleek, with the leaves (not yet expanded) numbered, and exhibiting the 13-ranked arrangement; and showing secondary spirals.

FIG. 192. Opposite leaves of Euonymus, or Spindle-tree, showing the successive pairs crossing each other at right angles.

Plicate or *Plaited* (Fig. 194), as in the Maple and Currant. If rolled, it may be so either from the tip downwards, as in Ferns and the Sundew (Fig. 197), when in unrolling it resembles the head of a crosier, and is said to be *Circinate;* or it may be rolled up parallel with the axis, either from one edge into a coil, when it is *Convolute* (Fig. 195), as in the Apricot and Plum; or rolled from both edges towards the midrib, — sometimes inwards, when it is *Involute* (Fig. 198), as in the Violet and Water-Lily; sometimes outwards, when it is *Revolute* (Fig. 196), in the Rosemary and Azalea. The figures are diagrams, representing sections through the leaf, in the way they were represented by Linnæus.



Section VIII. FLOWERS.

196. Flowers are for the production of seed (16). Stems and branches, which for a time put forth leaves for vegetation, may at length put forth flowers for reproduction.

§ 1. POSITION AND ARRANGEMENT OF FLOWERS, OR INFLORESCENCE.

197. Flower-buds appear just where leaf-buds appear; that is, they are either *terminal* or *axillary* (47–49). Morphologically, flowers answer to shoots or branches, and their parts to leaves.

198. In the same species the flowers are usually from axillary buds only, or from terminal buds only; but in some they are both axillary and terminal.

199. Inflorescence, which is the name used by Linnæus to signify mode of flower-arrangement, is accordingly of three classes: namely, *Indeterminate*, when the flowers are in the axils of leaves, that is, are from axillary buds; *Determinate*, when they are from terminal buds, and so *terminate* a stem or branch; and *Mixed*, when these two are combined.

200. Indeterminate Inflorescence (likewise, and for the same reason, called *indefinite inflorescence*) is so named because, as the flowers all come from axillary buds, the terminal bud may keep on growing and prolong the stem indefinitely. This is so in Moneywort (Fig. 199).

201. When flowers thus arise singly from the axils of ordinary leaves, they are *axillary* and *solitary*, not collected into flower-clusters.

202. But when several or many flowers are produced near each other, the accompanying leaves are apt to be of smaller size, or of different shape or character: then they are called BRACTS, and the flowers thus brought together form a cluster. The kinds of flower-clusters of the indeterminate class have received distinct names, according to their form and disposition. They are principally *Raceme, Corymb, Umbel, Spike, Head, Spadix, Catkin,* and *Panicle.*

199

203. In defining these it will be necessary to use some of the following terms of descriptive botany which relate to inflorescence. If a flower is stalkless, i. e. sits directly in the axil or other support, it is said to be *sessile.* If raised on a naked stalk of its own (as in Fig. 199) it is *pedunculate,* and the stalk is a PEDUNCLE.

200

204. A peduncle on which a flower-cluster is raised is a *Common peduncle.* That which supports each separate flower of the cluster is a *Partial peduncle,* and is generally called a PEDICEL. The portion of the general stalk along which flowers are disposed is called the *Axis of inflorescence,* or, when covered with sessile flowers, the *Rhachis* (back-bone), and sometimes the *Receptacle.* The leaves of a flower-cluster generally are termed BRACTS. But when bracts of different orders are to be distinguished, those on the common peduncle or axis, and which have a flower in their axil, keep the name of *bracts;* and those on the pedicels or partial flower-stalks, if any, that of BRACTLETS or *Bracteoles.* The former is the preferable English name.

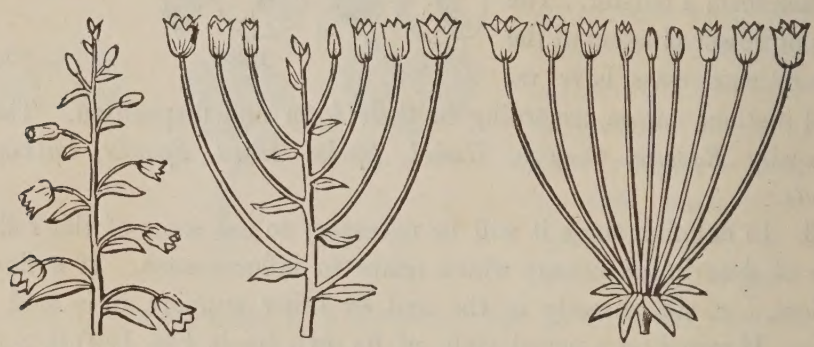
205. **A Raceme** (Fig. 200) is that form of flower-cluster in which the flowers, each on their own foot-stalk or pedicel, are arranged along the sides of a common stalk or axis of inflorescence; as in the Lily of the Valley, Currant, Barberry, one section of Cherry, etc. Each flower comes from the axil of a small leaf, or bract, which, however, is often so small that it might escape notice, and even sometimes (as in the Mustard Family) disappears altogether. The lowest blossoms of a

FIG. 199. Piece of a flowering-stem of Moneywort (Lysimachia nummularia,) with single flowers successively produced in the axils of the leaves, from below upwards, as the stem grows on.

FIG. 200. A raceme, with a general peduncle (*p*), pedicels (*p'*), bracts (*b*), and bractlets (*b'*). Plainly the bracts here answer to the leaves in Fig. 199.

raceme are of course the oldest, and therefore open first, and the order of blossoming is *ascending* from the bottom to the top. The summit, never being stopped by a terminal flower, may go on to grow, and often does so (as in the common Shepherd's Purse), producing lateral flowers one after another for many weeks.

206. **A Corymb** (Fig. 202) is the same as a raceme, except that it is flat and broad, either convex, or level-topped. That is, a raceme becomes a corymb by lengthening the lower pedicels while the uppermost remain



201 202 203

shorter. The axis of a corymb is short in proportion to the lower pedicels By extreme shortening of the axis the corymb may be converted into

207. **An Umbel** (Fig. 203) as in the Milkweed, a sort of flower-cluster where the pedicels all spring apparently from the same point, from the top of the peduncle, so as to resemble, when spreading, the rays of an umbrella; whence the name. Here the pedicels are sometimes called the *Rays* of the umbel. And the bracts, when brought in this way into a cluster or circle, form what is called an INVOLUCRE.

204

208. The corymb and the umbel being more or less level-topped, bringing the flowers into a horizontal plane or a convex form, the ascending order of development appears as *Centripetal.* That is, the flowering proceeds from the margin or circumference regularly towards the centre; the lower flowers of the former answering to the outer ones of the latter.

209. In these three kinds of flower-clusters, the flowers are raised on conspicuous *pedicels* (204) or stalks of their own. The shortening of these pedicels, so as to render the flowers *sessile* or nearly so, converts a raceme into a *Spike,* and a corymb or an umbel into a *Head.*

210. **A Spike** is a flower-cluster with a more or less lengthened axis, along which the flowers are sessile or nearly so; as in the Plantain (Fig. 204).

211. **A Head** (*Capitulum*) is a round or roundish cluster of flowers,

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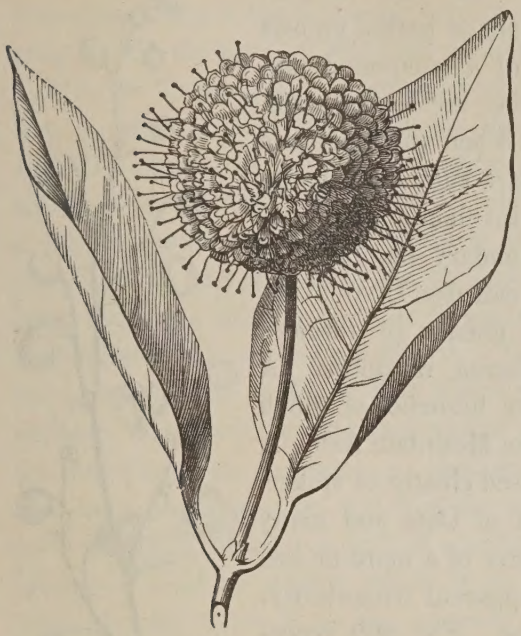
FIG. 201. A raceme. 202. A corymb. 203. An umbel.
FIG. 204. Spike of the common Plantain or Ribwort.

which are sessile on a very short axis or receptacle, as in the Button-ball, Button-bush (Fig. 205), and Red Clover. It is just what a spike would



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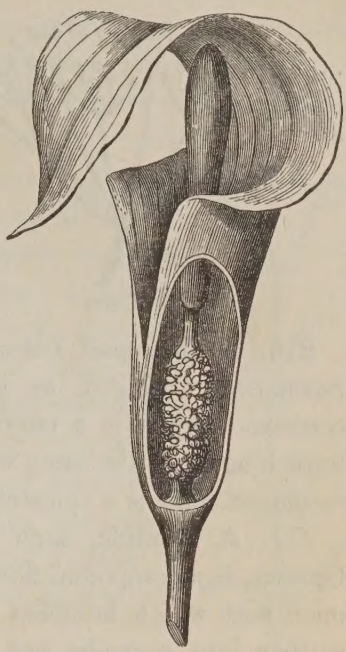

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become if its axis were shortened; or an umbel, if its pedicels were all shortened until the flowers became sessile. The head of the Button-bush is naked; but that of the Thistle, of the Dandelion, and the like, is surrounded by empty bracts, which form an *Involucre*. Two particular forms of the spike and the head have received particular names, namely, the *Spadix* and the *Catkin*.

212. **A Spadix** is a fleshy spike or head, with small and often imperfect flowers, as in the Calla, Indian Turnip, (Fig. 206), Sweet Flag, etc. It is commonly surrounded or embraced by a peculiar enveloping leaf, called a SPATHE.

213. **A Catkin, or Ament,** is the name given to the scaly sort of spike of the Birch (Fig. 207) and Alder, the Willow and Poplar, and one sort of flower-clusters of the Oak, Hickory, and the like, — the so-called *Amentaceous* trees.

214. *Compound* flower-clusters of these kinds are not uncommon. When the stalks which in the simple umbel are the pedicels of single flowers themselves branch into an umbel, a *Compound Umbel* is formed.

207

FIG. 205. Head of the Button-bush (Cephalanthus).

FIG. 206. Spadix and spathe of the Indian Turnip; the latter cut through below.

FIG. 207. Catkin, or Ament, of Birch.

This is the inflorescence of Caraway (Fig. 208), Parsnip, and almost all of the great family of Umbelliferous (umbel-bearing) plants.

208

215. The secondary or partial umbels of a compound umbel are UMBELLETS. When the umbellets are subtended by an involucre, this secondary involucre is called an INVOLUCEL.

209

216. A *Compound raceme* is a cluster of racemes racemosely arranged, as in Smilacina racemosa. A *compound corymb* is a corymb some branches of which branch again in the same way, as in Mountain Ash. A *compound spike* is a spicately disposed cluster of spikes.

217. **A Panicle**, such as that of Oats and many Grasses, is a compound flower-cluster of a more or less open sort which branches with apparent irregularity, neither into corymbs nor racemes. Fig. 209 represents the simplest panicle. It is, as it were, a raceme of which some of the pedicels have branched so as to bear a few flowers on pedicels of their own, while others remain simple. A *compound panicle* is one that branches in this way again and again.

218. **Determinate Inflorescence** is that in which the flowers are from terminal buds. The simplest case is that of a solitary terminal flower, as

210

211

212

in Fig. 210. This stops the growth of the stem; for its terminal bud, becoming a blossom, can no more lengthen in the manner of a leaf-bud. Any

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FIG. 208. Compound Umbel of Caraway.

FIG. 209. Diagram of a simple panicle.

FIG. 210. Diagram of an opposite-leaved plant, with a single terminal flower. 211. Same, with a cyme of three flowers; *a*, the first flower, of the main axis; *b b*, those of branches. 212. Same, with flowers also of the third order, *c c*.

further growth must be from axillary buds developing into branches. If such branches are leafy shoots, at length terminated by single blossoms, the inflorescence still consists of solitary flowers at the summit of stem and branches. But if the flowering branches bear only bracts in place of ordinary leaves, the result is the kind of flower-cluster called

219. **A Cyme.** This is commonly a flat-topped or convex flower-cluster, like a corymb, only the blossoms are from terminal buds. Fig. 211 illustrates the simplest cyme in a plant with opposite leaves, namely, with three flowers. The middle flower, *a*, terminates the stem; the two others, *b b*, terminate branches, one from the axil of each of the uppermost leaves; and being later than the middle one, the flowering proceeds from the centre outwards, or is *Centrifugal*. This is the opposite of the indeterminate mode, or that where all the flower-buds are axillary. If flowering branches appear from the axils below, the lower ones are the later, so that the order of blossoming continues *centrifugal* or, which is the same thing, *descending*, as in Fig. 213, making a sort of reversed raceme or *false raceme*,—a kind of cluster which is to the true raceme just what the flat cyme is to the corymb.

213

220. Wherever there are bracts or leaves, buds may be produced from their axils and appear as flowers. Fig. 212 represents the case where the branches, *b b*, of Fig. 211, each with a pair of small leaves or bracts about their middle, have branched again, and produced the branchlets and flowers *c c*, on each side. It is the continued repetition of this which forms the full or compound cyme, such as that of the Laurestinus, Hobble-bush, Dogwood, and Hydrangea (Fig. 214).

221. **A Fascicle** (meaning a bundle), like that of the Sweet William and Lychnis of the gardens, is only a cyme with the flowers much crowded.

222. **A Glomerule** is a cyme still more compacted, so as to imitate a head. It may be known from a true head by the flowers not expanding centripetally, that is, not from the circumference towards the centre.

223. The illustrations of determinate or *cymose* inflorescence have been taken from plants with opposite leaves, which give rise to the most regular cymes. But the Rose, Cinquefoil, Buttercup, etc., with alternate leaves, furnish also good examples of cymose inflorescence.

224. **A Cymule** (or diminutive cyme) is either a reduced small cyme of few flowers, or a branch of a compound cyme, i. e. a partial cyme.

225. **Scorpioid** or **Helicoid Cymes**, of various sorts, are forms of determinate inflorescence (often puzzling to the student) in which one half of the ramification fails to appear. So that they may be called *incomplete cymes*. The commoner forms may be understood by comparing a complete

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FIG. 213. Diagram of a simple cyme in which the axis lengthens, so as to take the form of a raceme.

cyme, like that of Fig. 215 with Fig. 216, the diagram of a cyme of an opposite-leaved plant, having a series of terminal flowers and the axis con-

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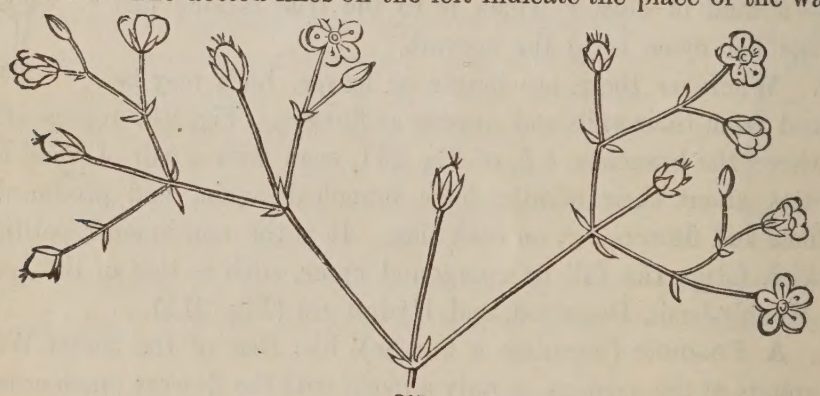
tinued by the development of a branch in the axil of only one of the leaves at each node. The dotted lines on the left indicate the place of the wanting



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branches, which if present would convert this *scorpioid cyme* into the complete one of Fig. 215. Fig. 217 is a diagram of similar inflorescence with alternate leaves. Both are kinds of *false racemes* (219). When the bracts are also wanting in such cases, as in many Borragineous plants, the true nature of the inflorescence is very much disguised.

216 217

Fig. 214. Compound cyme of Hydrangea arborescens, with neutral enlarged flowers round the circumference.

Fig. 215. A complete forking cyme of an Arenaria, or Chickweed.

Fig. 216. Diagram of a scorpioid cyme, with opposite leaves or bracts.

Fig. 217. Diagram of analogous scorpioid cyme, with alternate leaves or bracts.

226. These distinctions between determinate and indeterminate inflorescence, between corymbs and cymes, and between the true and the false raceme and spike, were not recognized by botanists much more than half a century ago, and even now are not always attended to in descriptions. It is still usual and convenient to describe rounded or flat-topped and open ramification as *corymbose,* even when essentially cymose; also to call the reversed or false racemes or spikes by these (strictly incorrect) names.

227. **Mixed Inflorescence** is that in which the two plans are mixed or combined in compound clusters. A *mixed panicle* is one in which, while the primary ramification is of the indeterminate order, the secondary or ultimate is wholly or partly of the determinate order. A contracted or elongated inflorescence of this sort is called a THYRSUS. Lilac and Horse-chestnut afford common examples of mixed inflorescence of this sort. When loose and open such flower-clusters are called by the general name of *Panicles.* The heads of Compositæ are centripetal; but the branches or peduncles which bear the heads are usually of centrifugal order.

§ 2. PARTS OR ORGANS OF THE FLOWER.

228. These were simply indicated in Section II. 16. Some parts are necessary to seed-bearing; these are *Essential Organs,* namely, the *Stamens* and *Pistils.* Others serve for protection or for attraction, often for both. Such are the leaves of the Flower, or the *Floral Envelopes.*

229. **The Floral Envelopes,** taken together, are sometimes called the PERIANTH, also *Perigone,* in Latin form *Perigonium.* In a flower which possesses its full number of organs, the floral envelopes are of two kinds, namely, an outer circle, the CALYX, and an inner, the COROLLA.

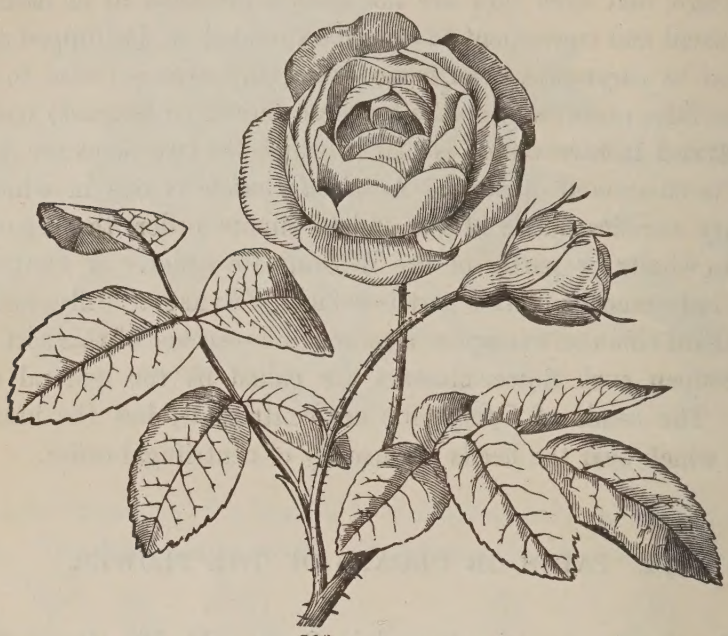
230. **The Calyx** is commonly a circle of green or greenish leaves, but not always. It may be the most brightly colored part of the blossom. Each calyx-leaf or piece is called a SEPAL.

231. **The Corolla** is the inner circle of floral envelopes or flower-leaves, usually of delicate texture and *colored,* that is, of some other color than green. Each corolla-leaf is called a PETAL.

232. There are flowers in abundance which consist wholly of floral envelopes. Such are the so-called full *double flowers,* of which the choicer roses and camellias of the cultivator are familiar examples. In them, under the gardener's care and selection, petals have taken the place of both stamens and pistils. These are monstrous or unnatural flowers, incapable of producing seed, and subservient only to human gratification. Their common name of *double* flowers is not a sensible one: except that it is fixed by custom, it were better to translate their Latin name, *flores pleni,* and call them *full flowers,* meaning full of leaves.

233. Moreover, certain plants regularly produce *neutral flowers,* consisting of floral envelopes only. In Fig. 214, some are seen around the margin

of the cyme in Hydrangea. They are likewise familiar in the Hobble-bush and in Wild-Cranberry tree, Viburnum Oxycoccus; where they form an attractive setting to the cluster of small and comparatively inconspicuous



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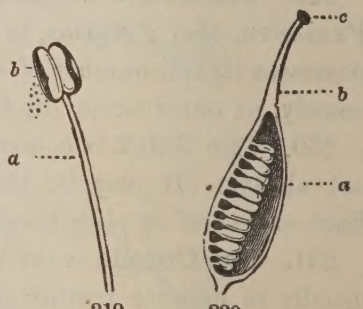
perfect flowers which they adorn. In the Guelder Rose, or Snow-ball of ornamental cultivation, all or most of the blossoms of this same shrub are transformed into neutral flowers.

234. **The Essential Organs** are likewise of two kinds, placed one above or within the other; namely, first, the STAMENS or fertilizing organs, and second, the PISTILS, which are to be fertilized and bear the seeds.



219 220

235. **A Stamen** consists of two parts, namely, the FILAMENT or stalk (Fig. 219 *a*), and the ANTHER (*b*). The latter is the only essential part. It is a case, commonly with two lobes or cells, each opening lengthwise by a slit, at the proper time, and discharging a powder or dust-like substance, usually of a yellow color. This powder is the POLLEN, or fertilizing matter, to produce which is the office of the stamen.

236. **A Pistil** (Fig. 220, 221) when complete, has three parts; OVARY, STYLE, and STIGMA. The *Ovary*, at base, is the hollow portion, which contains one or more OVULES or rudimentary seeds. The *Style* is the tapering

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FIG. 218. A *flos plenus*, namely, a full double flower of Rose.

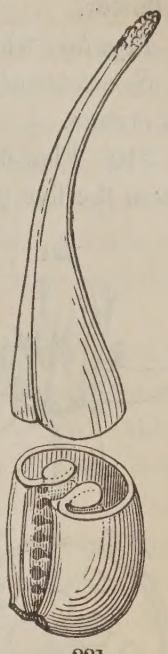
FIG. 219. A stamen: *a*, filament: *b*, anther, discharging pollen.

FIG. 220. A pistil; with ovary, *a*, half cut away, to show the contained ovules; *b*, style; *c*, stigma.

portion above: the *Stigma* is a portion of the style, usually its tip, with moist naked surface, upon which grains of pollen may lodge and adhere, and thence make a growth which extends down to the ovules. When there is no style then the stigma occupies the tip of the ovary.

237. **The Torus** or **Receptacle** is the end of the flower-stalk, or the portion of axis or stem out of which the several organs of the flower grow, upon which they are borne (Fig. 223).

238. The parts of the flower are thus disposed on the receptacle or axis essentially as are leaves upon a very short stem; first the sepals, or outer floral leaves; then the petals or inner floral leaves; then the stamens; lastly, at summit or centre, the pistils, when there are two or more of them, or the single pistil, when only one. Fig. 223 shows the organs displayed, two of each kind, of such a simple and symmetrical flower as that of a Sedum or Stonecrop, Fig. 222.



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§ 3. PLAN OF FLOWER.

239. All flowers are formed upon one general plan, but with almost infinite variations, and many disguises. This common plan is best understood by taking for a type, or standard for comparison, some *perfect*, *complete*,

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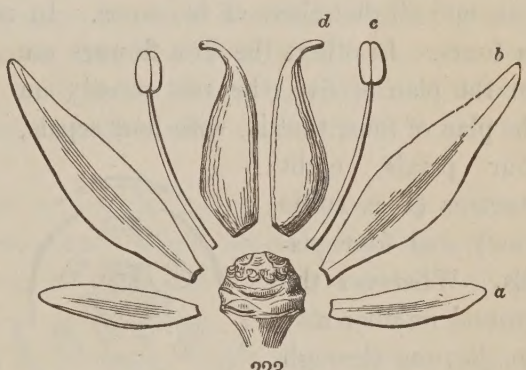

223

regular, and *symmetrical* blossom, and one as simple as such a blossom could well be. Flowers are said to be

Perfect (*hermaphrodite*), when provided with both kinds of essential organs, i. e. with both stamens and pistils.

Complete, when, besides, they have the two sets of floral envelopes, namely,

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FIG. 221. Model of a simple pistil, with ovary cut across and slightly opened ventrally, to show the ovules and their attachment.

FIG. 222. Flower of Sedum ternatum, a Stonecrop.

FIG. 223. Parts of same, two of each kind, separated and displayed; the torus or receptacle in the centre; *a*, a sepal; *b*, a petal; *c*, a stamen; *d*, a pistil.

calyx and corolla. Such are completely furnished with all that belongs to a flower.

Regular, when all the parts of each set are alike in shape and size.

Symmetrical, when there is an equal number of parts in each set or circle of organs.

240. Flax-flowers were taken for a pattern in Section II. 16. But in them the five pistils have their ovaries as it were consolidated into one body. Sedum, Fig. 222, has the pistils and all the other parts free from such combination. The flower is perfect, complete, regular, and symmetrical, but is not quite as simple as it might be; for there are twice as many stamens as there are of the other organs. Crassula, a relative of Sedum, cultivated in the conservatories for winter blossoming (Fig. 224) is simpler, being *isostemonous*, or with just as many stamens as petals or sepals, while Sedum is *diplostemonous*, having double that number: it has, indeed, two sets of stamens.

224

225

241. **Numerical Plan.** A certain number either runs through the flower or is discernible in some of its parts. This number is most commonly either five or three, not very rarely four, occasionally two. Thus the *ground-plan* of the flowers thus far used for illustration is five. That of Trillium (Fig. 226, 227) is three, as it likewise is as really, if not as plainly, in Tulips and Lilies, Crocus, Iris, and all that class of blossoms. In some Sedums all the flowers are in fours. In others the first flowers are on the plan of five, the rest mostly on the plan of four, that is, with four sepals, four petals, eight stamens (i. e. twice four), and four pistils. Whatever the ground number may be, it runs through the whole in symmetrical blossoms.

227

226

242. **Alternation of the successive Circles.** In these flowers the parts of the successive circles *alternate;* and such is the rule. That is,

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Fig. 224. Flower of a Crassula. 225. Diagram or ground-plan of same.

Fig. 226. Flower of a Trillium; its parts in threes.

Fig. 227. Diagram of flower of Trillium. In this, as in all such diagrams of cross-section of blossoms, the parts of the outer circle represent the calyx; the next, corolla; within, stamens (here in two circles of three each, and the cross-section is through the anthers); in the centre, section of three ovaries joined into a compound one of three cells

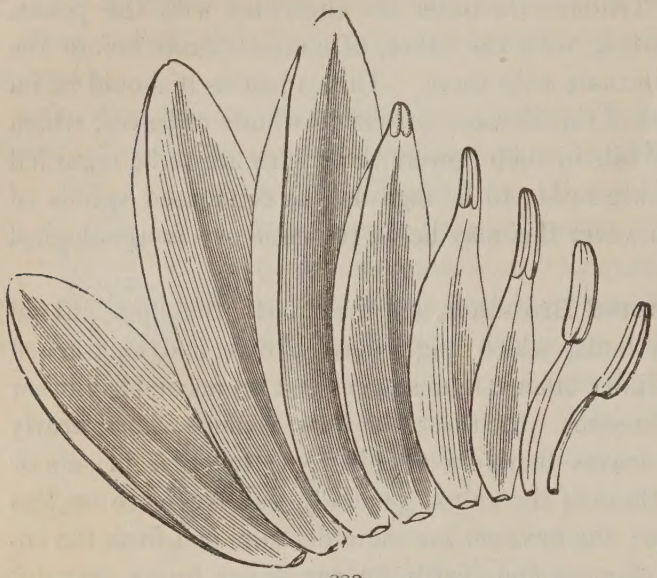
the petals stand over the intervals between the sepals; the stamens, when of the same number, stand over the intervals between the petals; or when twice as many, as in the Trillium, the outer set alternates with the petals, and the inner set, alternating with the other, of course stands before the petals; and the pistils alternate with these. This is just as it should be on the theory that the circles of the blossom answer to whorls of leaves, which alternate in this way. While in such flowers the circles are to be regarded as whorls, in others they are rather to be regarded as condensed spirals of alternate leaves. But, however this may be, in the mind of a morphological botanist,

243. **Flowers are altered Branches**, and their parts, therefore, altered leaves. That is, certain buds, which might have grown and lengthened into a leafy branch, do, under other circumstances and to accomplish other purposes, develop into blossoms. In these the axis remains short, nearly as it is in the bud; the leaves therefore remain close together in sets or circles; the outer ones, those of the calyx, generally partake more or less of the character of foliage; the next set are more delicate, and form the corolla, while the rest, the stamens and pistils, appear under forms very different from those of ordinary leaves, and are concerned in the production of seed. This view gives to Botany an interest which one who merely notices the shape and counts the parts of blossoms, without understanding their plan, has no conception of.

244. That flowers answer to branches may be shown, first, from their position. As explained in the section on Inflorescence, flowers arise from the same places as branches, and from no other; flower-buds, like leaf-buds, appear either on the summit of a stem, that is, as a terminal bud, or in the axil of a leaf, as an axillary bud. And, as the plan of a symmetrical flower shows, the arrangement of the parts on their axis or receptacle is that of leaves upon the stem.

245. That the sepals and petals are of the nature of leaves is evident from their appearance; they are commonly called the leaves of the flower. The calyx is most generally green in color, and foliaceous (leaf-like) in texture. And though the corolla is rarely green, yet neither are proper leaves always green. In our wild Painted-cup, and in some scarlet Sages, common in gardens, the leaves just under the flowers are of the brightest red or scarlet, often much brighter-colored than the corolla itself. And sometimes (as in many Cactuses, and in Carolina Allspice) there is such a regular gradation from the last leaves of the plant (bracts or bractlets) into the leaves of the calyx, that it is impossible to say where the one ends and the other begins. If sepals are leaves, so also are petals; for there is no clearly fixed limit between them. Not only in the Carolina Allspice and Cactus (Fig. 229), but in the Water-Lily (Fig. 228) and in a variety of flowers with more than one row of petals, there is such a complete transition between calyx and corolla that no one can surely tell how many of the leaves belong to the one and how many to the other.

246. That stamens are of the same general nature as petals, and therefore a modification of leaves, is shown by the gradual transitions that occur between the one and the other in many blossoms; especially in cultivated flowers, such as Roses and Camellias, when they begin to *double*, that is, to change their stamens into petals. Some wild and natural flowers show the same interesting transitions. The Carolina Allspice and the White Water-Lily exhibit complete gradations not only between sepals and petals, but between petals and stamens. The sepals of our Water-Lily are green outside, but white and petal-like on the inside; the petals, in many rows, gradually grow narrower towards the centre of the flower; some of these are tipped with a trace of a yellow anther, but still are petals; the next are more contracted and stamen-like, but with a flat petal-like filament; and a further narrowing of this completes the genuine stamen.



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247. Pistils and stamens now and then change into each other in some Willows; pistils often turn into petals in cultivated flowers; and in the Double Cherry they are occasionally replaced by small green leaves. Sometimes a whole blossom changes into a cluster of green leaves, as in the "green roses" occasionally noticed in gardens, and sometimes it degenerates into a leafy branch. So the botanist regards pistils also as answering to leaves; that is, to single leaves when simple and separate, to a whorl of leaves when conjoined.

229

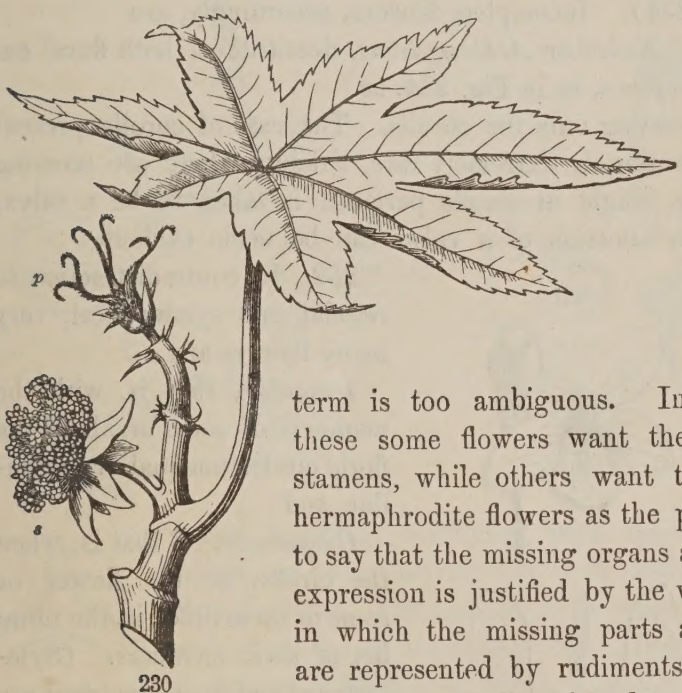
FIG. 228. Series of sepals, petals, and stamens of White Water-Lily, showing the transitions.

FIG. 229. A Cactus blossom.

§ 4. MODIFICATIONS OF THE TYPE.

248. **The Deviations**, as they may be called, from the assumed type or pattern of flower are most various and extensive. The differences between one species and another of the same genus are comparatively insignificant; those between different genera are more striking; those between different families and classes of plants more and more profound. They represent different adaptations to conditions or modes of life, some of which have obvious or probable utilities, although others are beyond particular explanation. The principal modifications may be conveniently classified. First those which in place of perfect (otherwise called *hermaphrodite* or bisexual) flowers, give origin to

249. **Unisexual, or Separated, or Diclinous Flowers**, *imperfect* flowers, as they have been called in contradistinction to perfect flowers; but that term is too ambiguous. In these some flowers want the stamens, while others want the pistils. Taking hermaphrodite flowers as the pattern, it is natural to say that the missing organs are *suppressed*. This expression is justified by the very numerous cases in which the missing parts are *abortive*, that is, are represented by rudiments or vestiges, which serve to exemplify the plan, although useless as to office. Unisexual flowers are



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Monœcious (or *Monoicous*, i. e. of one household), when flowers of both sorts or sexes are produced by the same individual plant, as in the Ricinus or Castor-oil Plant, Fig. 230.

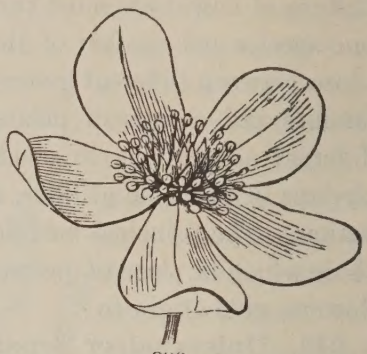
Diœcious (or *Dioicous*, i. e. of separate households), when the two kinds are borne on different plants; as in Willows, Poplars, Hemp, and Moonseed, Fig. 231, 232.

Polygamous, when the flowers are some of them perfect, and some staminate or pistillate only.

FIG. 230. Unisexual flowers of Castor-oil plant: *s*, staminate flower; *p*, pistillate flower.

FIG. 231, staminate, and 232, pistillate flower of Moonseed.

250. A blossom having stamens and no pistil is a *Staminate* or *Male* flower. Sometimes it is called a *Sterile* flower, not appropriately, for other flowers may equally be sterile. One having pistil but no stamens is a *Pistillate* or *Female* flower.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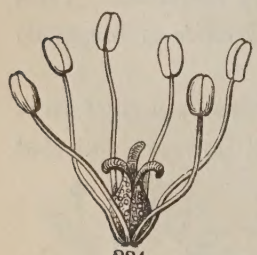
251. **Incomplete Flowers** are so named in contradistinction to complete: they want either one or both of the floral envelopes. Those of Fig. 230 are incomplete, having calyx but no corolla. So is the flower of Anemone (Fig. 233), although its calyx is colored like a corolla. The flowers of Saururus or Lizard's-tail, although perfect, have neither calyx nor corolla (Fig. 234). Incomplete flowers, accordingly, are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Naked or *Achlamydeous*, destitute of both floral envelopes, as in Fig. 234, or

Apetalous, when wanting only the corolla. The case of corolla present and calyx wholly wanting is extremely rare, although there are seeming instances. In fact, a single or simple perianth is taken to be a calyx, unless the absence or abortion of a calyx can be made evident.

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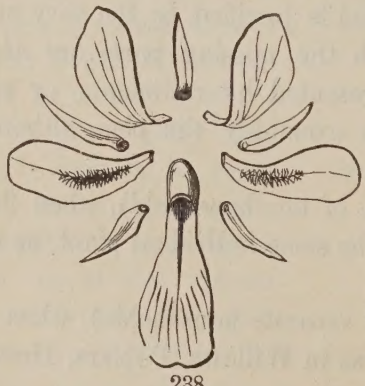
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252. In contradistinction to regular and symmetrical, very many flowers are

Irregular, that is, with the members of some or all of the floral circles unequal or dissimilar, and

Unsymmetrical, that is, when the circles of the flower or some of them differ in the number of their members. (Symmetrical and unsymmetrical are used in a different sense in some recent books, but the older use should be adhered to.) Want of numerical symmetry and irregularity commonly go together; and both are common. Indeed, few flowers are entirely

FIG. 233. Flower of Anemone Pennsylvanica; apetalous, hermaphrodite.
FIG. 234. Flower of Saururus or Lizard's-tail; naked, but hermaphrodite.
FIG. 235. Flower of Mustard. 236. Its stamens and pistil separate and enlarged.
FIG. 237. Flower of a Violet. 238. Its calyx and corolla displayed: the five smaller parts are the sepals; the five intervening larger ones are the petals.

symmetrical beyond calyx, corolla, and perhaps stamens; and probably no irregular blossoms are quite symmetrical.

253. **Irregular and Unsymmetrical Flowers** may therefore be illus-

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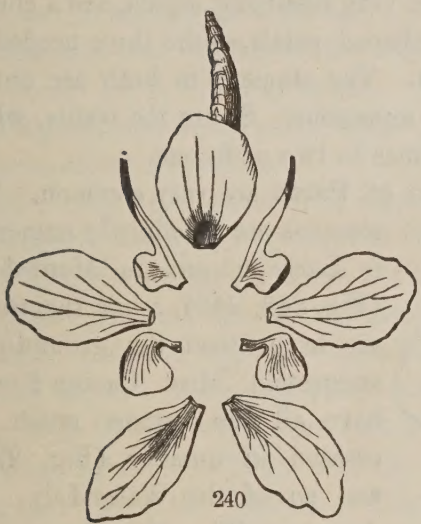

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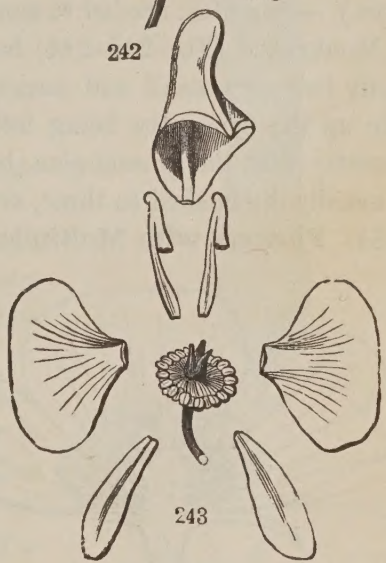

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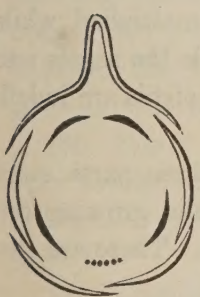

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trated together, beginning with cases which are comparatively free from other complications. The blossom of Mustard, and of all the very natural family which it represents (Fig. 235, 236), is regular but unsymmetrical in the stamens. There are four equal sepals, four equal petals; but six stamens, and only two members in the pistil, which for the present may

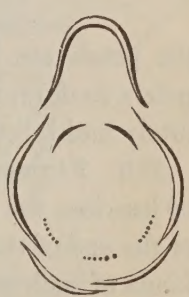

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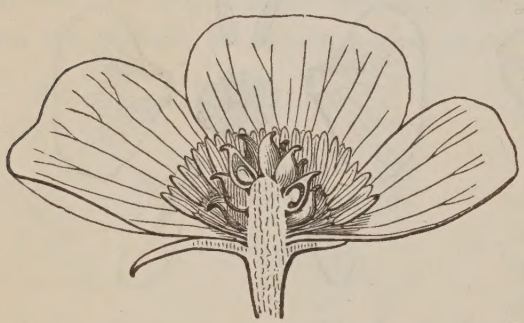
FIG. 239. Flower of a Larkspur. 240. Its calyx and corolla displayed; the five larger parts are the sepals; the four smaller, of two shapes, are the petals; the place of the fifth petal is vacant. 241. Diagram of the same; the place for the missing petal marked by a dotted line.

FIG. 242. Flower of a Monkshood. 243. Its parts displayed; five sepals, the upper forming the hood; the two lateral alike, broad and flat; the two lower small. The two pieces under the hood represent the corolla, reduced to two odd-shaped petals; in centre the numerous stamens and three pistils. 244. Diagram of the calyx and corolla; the three dotted lines in the place of missing petals.

be left out of view. The want of symmetry is in the stamens. These are in two circles, an outer and an inner. The outer circle consists of two stamens only; the inner has its proper number of four. The flower of Violet, which is on the plan of five, is symmetrical in calyx, corolla, and stamens, inasmuch as each of these circles consists of five members; but it is conspicuously irregular in the corolla, one of the petals being very different from the rest.

254. The flowers of Larkspur, and of Monkshood or Aconite, which are nearly related, are both strikingly irregular in calyx and corolla, and considerably unsymmetrical. In Larkspur (Fig. 239–241) the irregular calyx consists of five sepals, one of which, larger than the rest, is prolonged behind into a large sac or spur; but the corolla is of only four petals (of two shapes), — the fifth, needed to complete the symmetry, being left out. And the Monkshood (Fig. 242–244) has five very dissimilar sepals, and a corolla of only two very small and curiously-shaped petals, — the three needed to make up the symmetry being left out. The stamens in both are out of symmetry with the ground-plan, being numerous. So are the pistils, which are usually diminished to three, sometimes to two or to one.

255. **Flowers with Multiplication of Parts** are very common. The stamens are indefinitely numerous in Larkspur and in Monkshood (Fig. 242, 243), while the pistils are fewer than the ground-plan suggests. Most Cactus-flowers have all the organs much increased in number (Fig. 229), and so of the Water-Lily. In Anemone (Fig. 233) the stamens and pistils are multiplied while the petals are left out. In Buttercups or Crowfoot, while the sepals and petals conform to the ground-plan of five, both stamens and pistils are indefinitely multiplied (Fig. 245).



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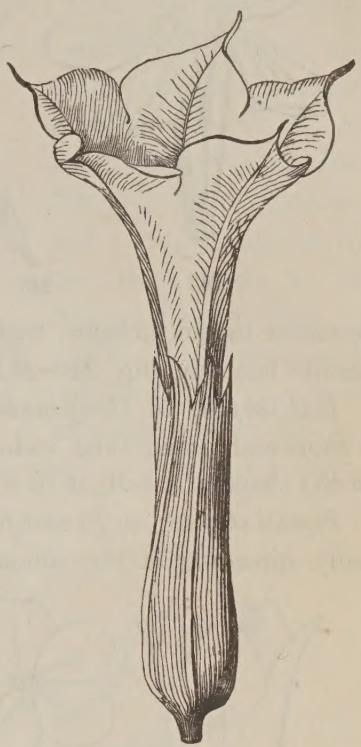
256. **Flowers modified by Union of Parts**, so that these parts more or less lose the appearance of separate leaves or other organs growing out of the end of the stem or receptacle, are extremely common. There are two kinds of such union, namely: —

Coalescence of parts of the same circle by their contiguous margins; and *Adnation*, or the union of adjacent circles or unlike parts.

257. Coalescence is not rare in leaves, as in the upper pairs of Honeysuckles, Fig. 163. It may all the more be expected in the crowded circles or whorls of flower-leaves. Datura or Stramonium (Fig. 246) shows this coalescence both in calyx and corolla, the five sepals and the five petals being thus united to near their tips, each into a tube or long and narrow cup. These unions make needful the following terms: —

FIG. 245. Flower of Ranunculus bulbosus, or Buttercup, in section.

Gamopetalous, said of a corolla the petals of which are thus coalescent into one body, whether only at base or higher. The union may extend to the very summit, as in Morning Glory and the like (Fig. 247), so that the number of petals in it may not be apparent. The old name for this was *Monopetalous*, but that means "one-petalled;" while gamopetalous means "petals united," and therefore is the proper term.



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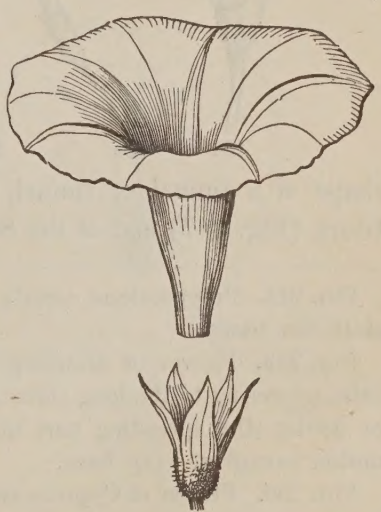
Polypetalous is the counterpart term, to denote a corolla of *distinct*, that is, separate petals. As it means "many petalled," it is not the best possible name, but it is the old one and in almost universal use.

Gamosepalous applies to the calyx when the sepals are in this way united.

Polysepalous, to the calyx when of separate sepals or calyx-leaves.

258. Degree of union or of separation in descriptive botany is expressed in the same way as is the lobing of leaves (139). See Fig. 249–253, and the explanations.

259. A corolla when gamopetalous commonly shows a distinction (well marked in Fig. 249–251) between a contracted tubular portion below, the TUBE, and the spreading part above, the BORDER or LIMB. The junction between tube and limb, or a more or less enlarged upper portion of the tube between the two, is the THROAT. The same is true of the calyx.



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260. Some names are given to particular forms of the gamopetalous corolla, applicable also to a gamosepalous calyx, such as

Wheel-shaped, or *Rotate;* when spreading out at once, without a tube or with a very short one, something in the shape of a wheel or of its diverging spokes, Fig. 252, 253.

Salver-shaped, or *Salver-form;* when a flat-spreading border is raised on

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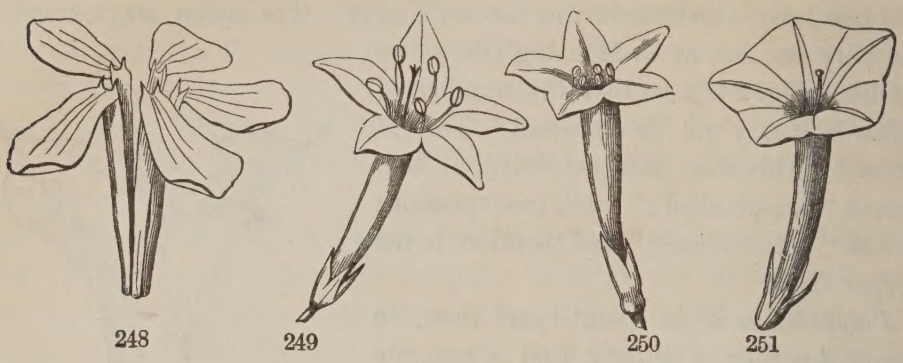
FIG. 246. Flower of Datura Stramonium; gamosepalous and gamopetalous.

FIG. 247. Funnelform corolla of a common Morning Glory, detached from its polysepalous calyx.

a narrow tube, from which it diverges at right angles, like the salver rep-



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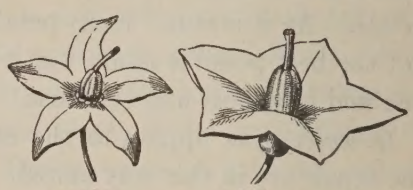
resented in old pictures, with a slender handle beneath, Fig. 249–251, 255.

Bell-shaped, or *Campanulate;* where a short and broad tube widens upward, in the shape of a bell, as in Fig. 254.



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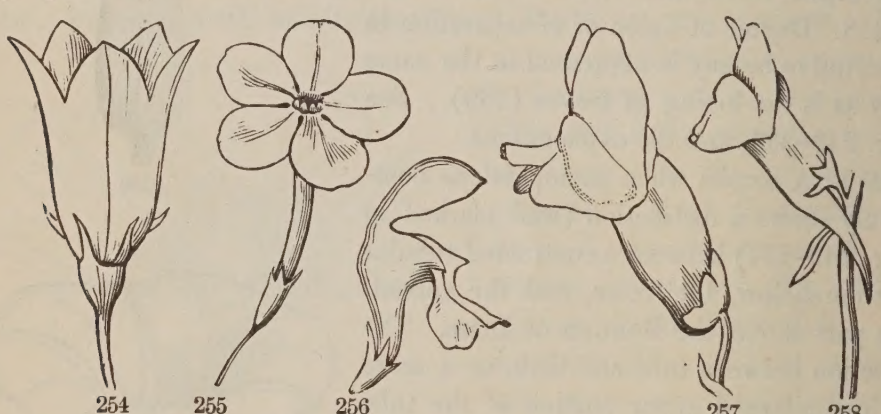
Funnel-shaped, or *Funnel-form;* gradually spreading at the summit of a tube which is narrow below, in the



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shape of a funnel or tunnel, as in the corolla of the common Morning Glory (Fig. 247) and of the Stramonium (Fig. 246).

Fig. 248. Polypetalous corolla of Soapwort, of five petals with long claws or stalk-like bases.

Fig. 249. Flower of Standing Cypress (Gilia coronopifolia); gamopetalous: the tube answering to the long claws in 248, except that they are coalescent: the limb or border (the spreading part above) is *five-parted*, that is, the petals not there united except at very base.

Fig. 250. Flower of Cypress-vine (Ipomœa Quamoclit); like preceding, but limb *five-lobed.*

Fig. 251. Flower of Ipomœa coccinea; limb almost *entire.*

Fig. 252. Wheel-shaped or rotate and five-parted corolla of Bittersweet, Solanum Dulcamara. 253. Wheel-shaped and five-lobed corolla of Potato.

Fig. 254, Flower of a Campanula or Harebell, with a campanulate or bell-shaped corolla; 255, of a Phlox, with salver-shaped corolla; 256, of Dead-Nettle (Lamium), with labiate *ringent* (or gaping) corolla; 257, of Snapdragon, with labiate *personate* corolla; 258, of Toad-Flax, with a similar corolla spurred at the base.

Tubular; when prolonged into a tube, with little or no spreading at the border, as in the corolla of the Trumpet Honeysuckle, the calyx of Stramonium (Fig. 246), etc.

261. Although sepals and petals are usually all blade or lamina (123), like a sessile leaf, yet they may have a contracted and stalk-like base, answering to petiole. This is called its CLAW, in Latin *Unguis*. *Unguiculate* petals are universal and strongly marked in the Pink tribe, as in Soapwort (Fig. 248).

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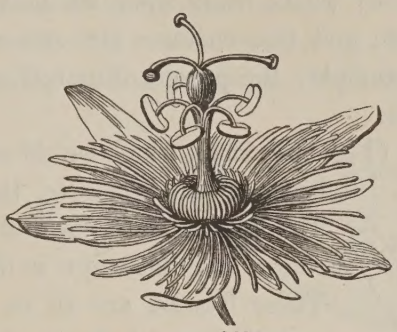

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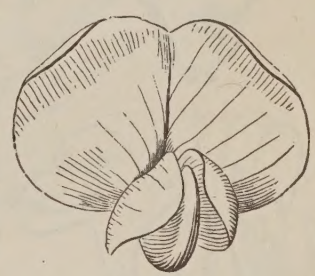
262. Such petals, and various others, may have an outgrowth of the inner face into an appendage or fringe, as in Soapwort, and in Silene (Fig. 259), where it is at the junction of claw and blade. This is called a CROWN, or *Corona*. In Passion-flowers (Fig. 260) the crown consists of numerous threads on the base of each petal.



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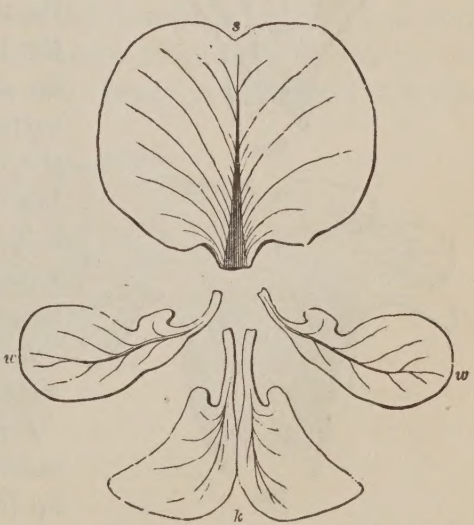
263. **Irregular Flowers** may be polypetalous, or nearly so, as in the papilionaceous corolla; but most of them are irregular through coalescence, which often much disguises the numerical symmetry also. As affecting the corolla the following forms have received particular names:



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264. **Papilionaceous Corolla**, Fig. 261, 262. This is polypetalous, except that two of the petals cohere, usually but slightly. It belongs only to the Leguminous or Pulse family. The name means butterfly-like; but the likeness is hardly obvious. The names of the five petals of the *papilionaceous* corolla are curiously incongruous. They are,

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FIG. 259. Unguiculate (clawed) petal of a Silene; with a two-parted crown.

FIG. 260. A small Passion-flower, with crown of slender threads.

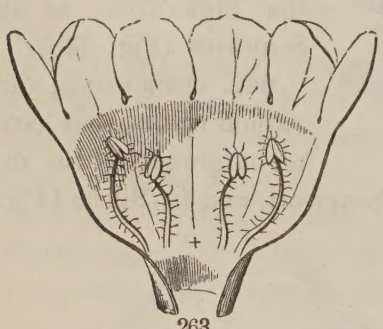
FIG. 261. Front view of a papilionaceous corolla. 262. The parts of the same, displayed: *s*, Standard, or Vexillum; *w*, Wings, or Alæ; *k*, Keel, or Carina.

The Standard or *Banner* (*Vexillum*), the large upper petal which is external in the bud and wrapped around the others.

The Wings (*Alæ*), the pair of side petals, of quite different shape from the standard.

The Keel (*Carina*), the two lower and usually smallest petals; these are lightly coalescent into a body which bears some likeness, not to the keel, but to the prow of a boat; and this encloses the stamens and pistil. A Pea-blossom is a typical example; the present illustration is from a species of Locust, Robinia hispida.

265. Labiate Corolla (Fig. 256–258), which would more properly have been called *Bilabiate*, that is, two-lipped. This is a common form of gamopetalous corolla; and the calyx is often bilabiate also. These flowers are all on the plan of five; and the irregularity in the corolla is owing to unequal union of the petals as well as to diversity of form. The two petals of the upper or posterior side of the flower unite with each other higher up than with the lateral petals (in Fig. 256, quite to the top), forming the *Upper lip:* the lateral and the lower similarly unite to form the *Lower lip*. The single notch which is generally found at the summit of the upper lip, and the two notches of the lower lip, or in other words the two lobes of the upper and the three of the lower lip, reveal the real composition. So also does the alternation of these five parts with those of the calyx outside. When the calyx is also bilabiate, as in the Sage, this alternation gives three lobes or sepals to the upper and two to the lower lip. Two forms of the labiate corolla have been designated, viz.: —



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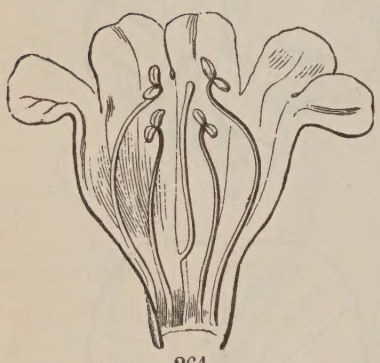

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Ringent or *Gaping*, when the orifice is wide open, as in Fig. 256.

Personate or *Masked*, when a protuberance or intrusion of the base of the lower lip (called a *Palate*) projects over or closes the orifice, as in Snapdragon and Toad-Flax, Fig. 257, 258.

Fig. 263. Corolla of a purple Gerardia laid open, showing the four stamens; the cross shows where the fifth stamen would be, if present.

Fig. 264. Corolla, laid open, and stamens of Pentstemon grandiflorus, with a sterile filament in the place of the fifth stamen, and representing it.

Fig. 265. Corolla of Catalpa laid open, displaying two good stamens and three abortive ones or vestiges.

266. There are all gradations between labiate and regular corollas. In those of Gerardia, of some species of Pentstemon, and of Catalpa (Fig. 263–265), the labiate character is slight, but is manifest on close inspection. In almost all such flowers the plan of five, which is obvious or ascertainable in the calyx and corolla, is obscured in the stamens by the abortion or suppression of one or three of their number.

267. **Ligulate Corolla.** The ligulate or *Strap-shaped* corolla mainly belongs to the family of Compositæ, in which numerous small flowers are

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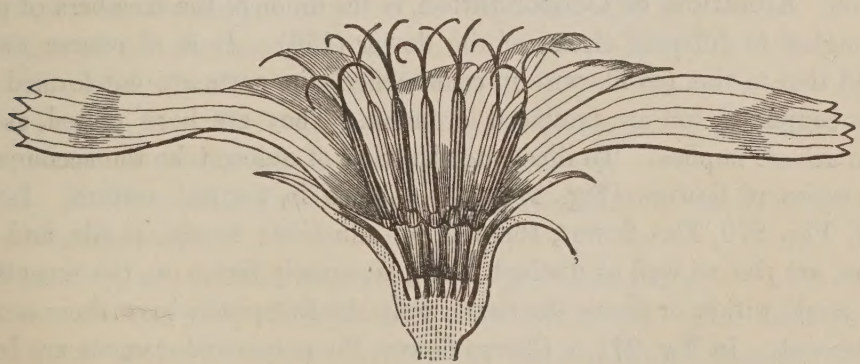
gathered into a head, within an involucre that imitates a calyx. It is best exemplified in the Dandelion and in Chiccory (Fig. 266). Each one of these straps or *Ligules*, looking like so many petals, is the corolla of a dis-



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tinct flower: the base is a short tube, which opens out into the ligule: the five minute teeth at the end indicate the number of constituent petals. So this is a kind of gamopetalous corolla, which is open along one side nearly

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FIG. 266. Two flower-heads of Chiccory.

FIG. 267. One of them half cut away, better showing some of the flowers.

to the base, and outspread. The nature of such a corolla (and of the stamens also, to be explained in the next section) is illustrated by the flower of a Lobelia, Fig. 285.

268. In Asters, Daisies, Sunflower, Coreopsis (Fig. 268), and the like, only the marginal (or *Ray*) corollas are ligulate; the rest (those of the *Disk*) are regularly gamopetalous, tubular, and five-lobed at summit; but they are small and individually inconspicuous, only the *ray-flowers* making a show. In fact, those of Coreopsis and of Sunflower are simply for show, these ray-flowers being not only sterile, but *neutral*, that is, having neither stamens nor pistil. But in Asters, Daisies, Golden-rods, and the like, these ray-flowers are pistillate and fertile, serving

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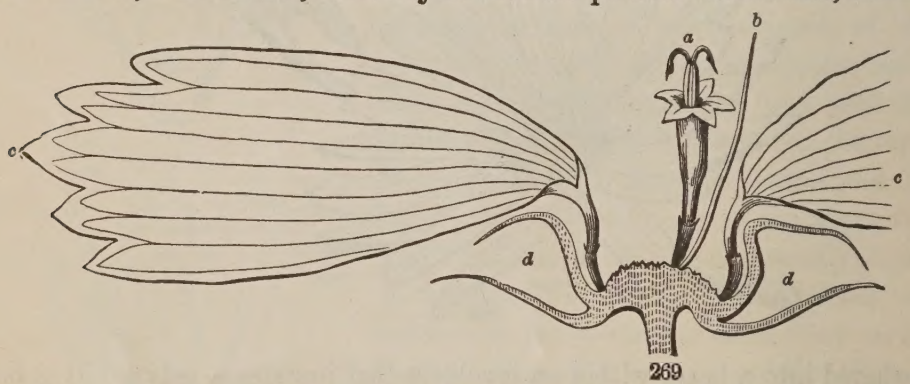

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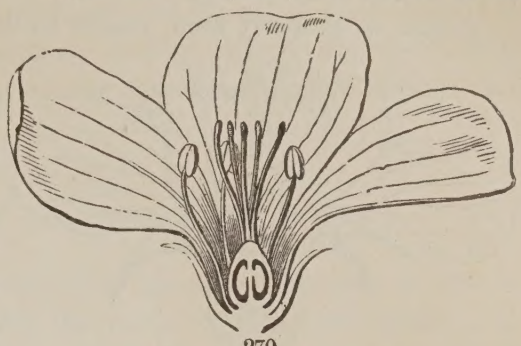
therefore for seed-bearing as well as for show. Let it not be supposed that the show is useless. See Section XIII.

269. Adnation, or Consolidation, is the union of the members of parts belonging to different circles of the flower (256). It is of course understood that in this (as likewise in coalescence) the parts are not formed and then conjoined, but are produced in union. They are born united, as the term *adnate* implies. To illustrate this kind of union, take the accompanying series of flowers (Fig. 270–274), shown in vertical section. In the first, Fig. 270, Flax-flower, there is no adnation; sepals, petals, and stamens, are *free* as well as distinct, being separately borne on the receptacle, one circle within or above the next; only the five pistils have their ovaries coalescent. In Fig. 271, a Cherry flower, the petals and stamens are borne on the throat of the calyx-tube; that is, the sepals are coalescent into a cup, and the petals and stamens are adnate to the inner face of this; in other

FIG. 268. Head of flowers of a Coreopsis, divided lengthwise.

FIG. 269. A slice of the preceding more enlarged, with one tubular perfect flower (*a*) left standing on the receptacle, with its bractlet or chaff (*b*), one ligulate and neutral ray-flower (*cc*), and part of another; *dd*, section of bracts or leaves of the involucre.

words, the sepals, petals, and stamens are all consolidated up to a certain height. In Fig. 272, a Purslane-flower, the same parts are adnate to or consolidated with the ovary up to its middle. In Fig. 273, a Hawthorn-flower, the consolidation has extended over the whole ovary; and petals and stamens are adnate to the calyx still further. In Fig. 274, a Cranberry-blossom, it is the same except that all the parts are free at the same height; all seem to arise from the top of the ovary.



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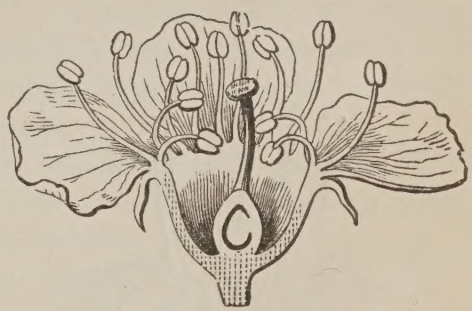

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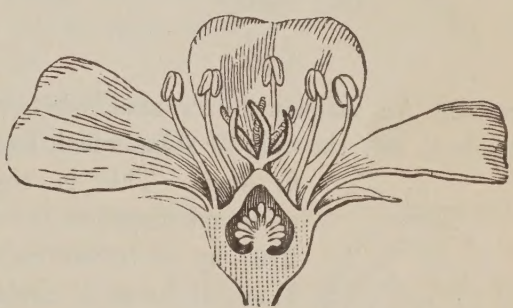

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270. In botanical description, to express tersely such differences in the relation of these organs to the pistil, they are said to be

Hypogynous (i. e. under the pistil) when they are all *free*, that is, not adnate to pistil nor connate with each other, as in Fig. 270.

Perigynous (around the pistil) when connate with each other, that is, when petals and stamens are *inserted* or borne on the calyx, whether as in Cherry-flowers (Fig. 271) they are free from the pistil, or as in Purslane and Hawthorn (Fig. 272, 273) they are also adnate below to the ovary.

Epigynous (on the ovary) when so adnate that all these parts appear to arise from the very summit of the ovary, as in Fig. 274. The last two terms are not very definitely distinguished.

271. Another and a simpler form of expression is to describe parts of the flower as being

Free, when not united with or *inserted* upon other parts.

Distinct, when parts of the same kind are not united. This term is the counterpart of coalescent, as free is the counterpart of adnate. Many writers use the term "free" indiscriminately for both; but it is better to distinguish them.

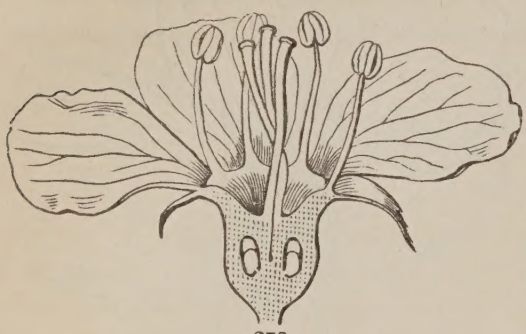
FIG. 270 Flax-flower in section; the parts all free, — hypogynous.

FIG. 271. Cherry-flower in section; petals and stamens adnate to tube of calyx, — perigynous.

FIG. 272. Purslane-flower in section; calyx, petals, stamens, all adnate to lower half of ovary, — perigynous.

Connate is a term common for either not free or not distinct, that is, for parts united congenitally, whether of same or of different kinds.

Adnate, as properly used, relates to the union of dissimilar parts.



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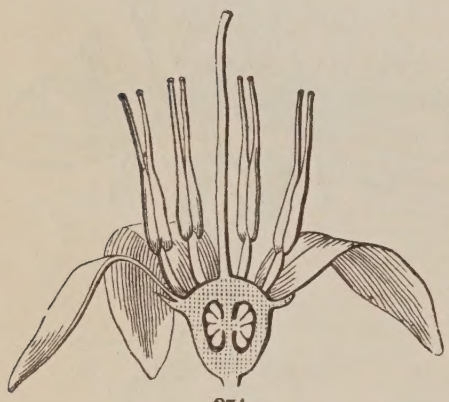

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272. In still another form of expression, the terms superior and inferior have been much used in the sense of above and below.

Superior is said of the ovary of Flax-flower, Cherry, etc., because above the other parts; it is equivalent to "ovary free." Or it is said of the calyx, etc., when above the ovary, as in Fig. 273–275.

Inferior, when applied to the ovary, means the same as "calyx adnate;" when applied to the floral envelopes, it means that they are free.

273. **Position of Flower or of its Parts.** The terms superior and inferior, or upper and lower, are also used to indicate the relative position of the parts of a flower in reference to the axis of inflorescence. An axillary flower stands between the bract or leaf which subtends it and the axis or stem which bears this bract or leaf. This is represented in sectional diagrams (as in Fig. 275, 276) by a transverse line for the bract, and a small circle for the axis of inflorescence. Now the side of the blossom which faces the bract is the

275

Anterior, or *Inferior*, or *Lower* side; while the side next the axis is the *Posterior*, or *Superior*, or *Upper* side of the flower.

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274. So, in the labiate corolla (Fig. 256–258), the lip which is composed of three of the five petals is the *anterior*, or *inferior*, or *lower* lip; the other is the *posterior*, or *superior*, or *upper* lip.

FIG. 273. Hawthorn-blossom in section; parts adnate to whole face of ovary, and with each other beyond; another grade of perigynous.

FIG. 274. Cranberry-blossom in section; parts epigynous.

FIG. 275. Diagram of papilionaceous flower (Robinia, Fig. 261), with bract below; axis of inflorescence above.

FIG. 276. Diagram of Violet-flower; showing the relation of parts to bract and axis.

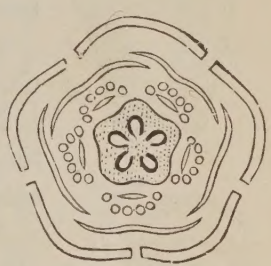
275. In Violets (Fig. 238, 276), the odd sepal is posterior (next the axis); the odd petal is therefore anterior, or next the subtending leaf. In the papilionaceous flower (Fig. 261, and diagram, Fig. 275), the odd sepal is anterior, and so two sepals are posterior; consequently, by the alternation, the odd petal (the standard) is posterior or upper, and the two petals forming the keel are anterior or lower.

§ 5. ARRANGEMENT OF PARTS IN THE BUD.

276. **Æstivation** was the fanciful name given by Linnæus to denote the disposition of the parts, especially the leaves of the flower, before *Anthesis*, i. e. before the blossom opens. *Præfloration*, a better term, is sometimes used. This is of importance in distinguishing different families or genera of plants, being generally uniform in each. The æstivation is best seen by making a slice across the flower-bud; and it may be expressed in diagrams, as in the accompanying figures.

277. The pieces of the calyx or the corolla either overlap each other in the bud, or they do not. When they do not overlap, the æstivation is

Valvate, when the pieces meet each other by their abrupt edges, without any infolding or overlapping; as the calyx of the Linden or Basswood (Fig. 277).



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Induplicate, which is valvate with the margins of each piece projecting inwards, as in the calyx of a common Virgin's-bower, Fig. 278, or

Involute, which is the same but the margins rolled inward, as in most of the large-flowered species of Clematis, Fig. 279.

Reduplicate, a rarer modification of valvate, is similar but with margins projecting outward.

278 279

Open, the parts not touching in the bud, as the calyx of Mignonette.

278. When the pieces overlap in the bud, it is in one of two ways; either every piece has one edge in and one edge out, or some pieces are wholly outside and others wholly inside. In the first case the æstivation is

Convolute, also named *Contorted* or *Twisted*, as in Fig. 280, a cross-section of a corolla very strongly thus convolute or rolled up together, and in the corolla of a Flax-flower (Fig. 281), where the petals only moderately overlap in this way. Here one edge of every petal covers the next before

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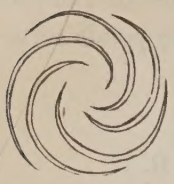
Fig. 277. Diagram of a flower of Linden, showing the calyx valvate and corolla imbricate in the bud, etc.

Fig. 278. Valvate-induplicate æstivation of calyx of common Virgin's-bower.
Fig. 279. Valvate-involute æstivation of same in Vine-bower, Clematis Vitialla.

it, while its other edge is covered by the next behind it. The other mode is the

Imbricate or *Imbricated*, in which the outer parts cover or overlap the inner so as to "break joints," like tiles or shingles on a roof; whence the name. When the parts are three, the first or outermost is wholly external, the third wholly internal, the second has one margin covered by the first while the other overlaps the third or innermost piece: this is the arrangement of alternate three-ranked leaves (187). When there are five pieces, as in the corolla of Fig. 225, and calyx of Fig. 281, as also of Fig. 241, 276, two are external, two are internal, and one (the third in the spiral) has one edge covered by the outermost, while its other edge covers the innermost; which is just the five-ranked arrangement of alternate leaves (188). When the pieces are four, two are outer and two are inner; which answers to the arrangement of opposite leaves.



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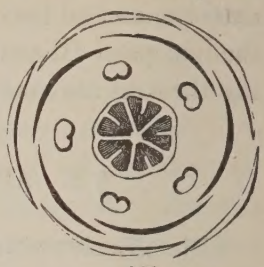

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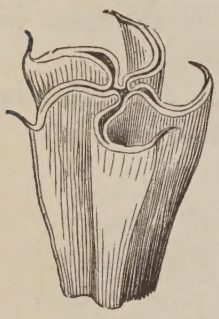

279. The imbricate and the convolute modes sometimes vary one into the other, especially in the corolla.

280. In a gamopetalous corolla or gamosepalous calyx, the shape of the tube in the bud may sometimes be noticeable. It may be

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Plicate or *Plaited*, that is, folded lengthwise; and the plaits may either be turned outwards, forming projecting ridges, as in the corolla of Campanula; or turned inwards, as in that of Gentian Belladonna; or

Supervolute, when the plaits are convolutely wrapped round each other, as in the corolla of Morning Glory and of Stramonium, Fig. 282.

Section IX. STAMENS IN PARTICULAR.

281. **Andrœcium** is a technical name for the staminate system of a flower (that is, for the stamens taken together), which it is sometimes convenient to use. The preceding section has dealt with modifications of the flower pertaining mainly to calyx and corolla. Those relating to the stamens are now to be indicated. First as to

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Fig. 280. Convolute æstivation, as in the corolla-lobes of Oleander.

Fig. 281. Diagram of a Flax-flower; calyx imbricated and corolla convolute in the bud.

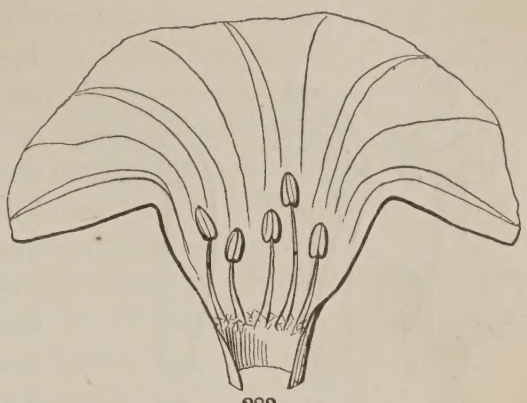
Fig. 282. Upper part of corolla of Datura Stramonium in the bud; and below a section showing the convolution of the plaits.

282. **Insertion**, or place of attachment. The stamens usually go with the petals. Not rarely they are at base

Epipetalous, that is, inserted on (or adnate to) the corolla, as in Fig. 283. When free from the corolla, they may be

Hypogynous, inserted on the receptacle under the pistil or gynœcium.

Perigynous, inserted on the calyx, that is, with the lower part of filament adnate to the calyx-tube.



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Epigynous, borne apparently on the top of the ovary; all which is explained in Fig. 270–274.

Gynandrous is another term relating to insertion of rarer occurrence, that is, where the stamens are inserted on (in other words, adnate to) the style, as in Lady's Slipper (Fig. 284), and in the Orchis family generally.

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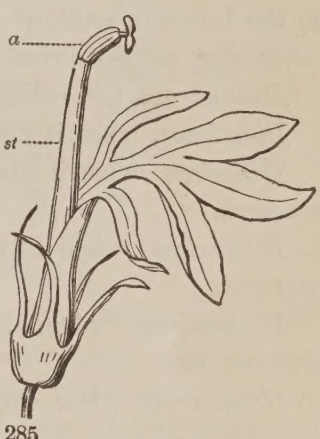
283. **In Relation to each Other**, stamens are more commonly

Distinct, that is, without any union with each other. But when united, the following technical terms of long use indicate their modes of mutual connection: —



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Monadelphous (from two Greek words, meaning "in one brotherhood"), when united by their filaments into one set, usually into a ring or cup below, or into a tube, as in the Mallow Family (Fig. 286), the Passion-flower (Fig. 260), the Lupine (Fig. 287), and in Lobelia (Fig. 285).

Diadelphous (meaning in two brotherhoods), when united by the filaments into two sets, as in the Pea and most of its near relatives (Fig. 288), usually nine in one set, and one in the other.

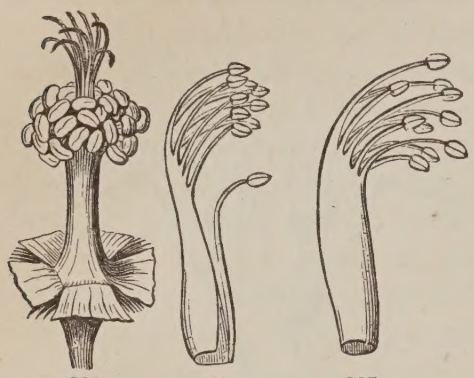
Triadelphous (three brotherhoods), when the filaments are united in three sets or clusters, as in most species of Hypericum.

FIG. 283. Corolla of Morning Glory laid open, to show the five stamens inserted on it, near the base.

FIG. 284. Style of a Lady's Slipper (Cypripedium), and stamens united with it; *a*, *a*, the anthers of the two good stamens; *st*, an abortive stamen, what should be its anther changed into a petal-like body; *stig*, the stigma.

FIG. 285. Flower of Lobelia cardinalis, Cardinal flower; corolla making approach to the ligulate form; filaments (*st*) monadelphous, and anthers (*a*) syngenesious.

Pentadelphous (five brotherhoods), when in five sets, as in some species of Hypericum and in American Linden (Fig. 277, 289).



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Polyadelphous (many or several brotherhoods) is the term generally employed when these sets are several, or even more than two, and the particular number is left unspecified. These terms all relate to the filaments.

Syngenesious is the term to denote that stamens have their anthers united, coalescent into a ring or tube; as in Lobelia (Fig. 285), in Violets, and in all of the great family of Compositæ.

284. **Their Number** in a flower is commonly expressed directly, but sometimes adjectively, by a series of terms which were the name of classes in the Linnæan artificial system, of which the following names, as also the preceding, are a survival: —

Monandrous, i. e. solitary-stamened, when the flower has only one stamen,

Diandrous, when it has two stamens only,

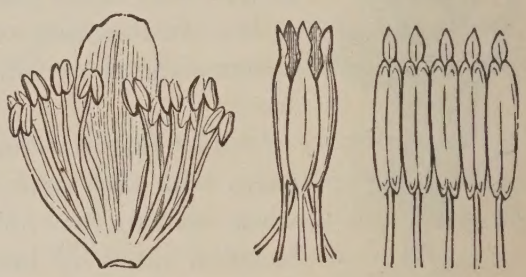
Triandrous, when it has three stamens,

Tetrandrous, when it has four stamens,

Pentandrous, when it has five stamens,

Hexandrous, when with six stamens, and so on to

Polyandrous, when it has many stamens, or more than a dozen.



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285. For which terms, see the Glossary. They are all Greek numerals prefixed to *-andria* (from the Greek), which Linnæus used for *andrœcium*, and are made into an English adjective, *-androus*. Two other terms, of same origin, designate particular cases of number (four or six) in connection with unequal length. Namely, the stamens are

Didynamous, when, being only four, they form two pairs, one pair longer than the other, as in the Trumpet Creeper, in Gerardia (Fig. 263), etc.

Fig. 286. Flower of a Mallow, with calyx and corolla cut away; showing monadelphous stamens.

Fig. 287. Monadelphous stamens of Lupine. 288. Diadelphous stamens (9 and 1) of a Pea-blossom.

Fig. 289. One of the five stamen-clusters of the flower of American Linden, with accompanying scale. The five clusters are shown in section in the diagram of this flower, Fig. 277.

Fig. 290. Five syngenesious stamens of a Coreopsis. 291. Same, with tube laid open and displayed.

Tetradynamous, when, being only six, four of them surpass the other two, as in the Mustard-flower and all the Cruciferous family, Fig. 235.

286. **The Filament** is a kind of stalk to the anther, commonly slender or thread-like: it is to the anther nearly what the petiole is to the blade of a leaf. Therefore it is not an essential part. As a leaf may be without a stalk, so the anther may be *Sessile*, or without a filament.

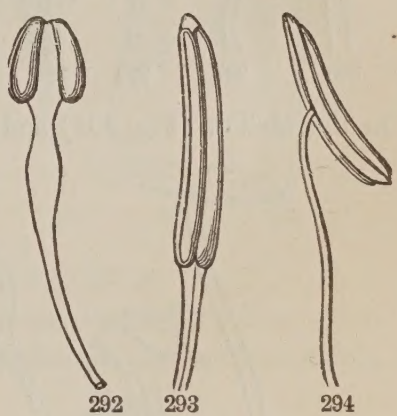
287. **The Anther** is the essential part of the stamen. It is a sort of case, filled with a fine powder, *the Pollen*, which serves to fertilize the pistil, so that it may perfect seeds. The anther is said to be

Innate (as in Fig. 292), when it is attached by its base to the very apex of the filament, turning neither inward nor outward;

Adnate (as in Fig. 293), when attached as it were by one face, usually for its whole length, to the side of a continuation of the filament; and

Versatile (as in Fig. 294), when fixed by or near its middle only to the very point of the filament, so as to swing loosely, as in the Lily, in Grasses, etc. Versatile or adnate anthers are

Introrse, or *Incumbent*, when facing inward, that is, toward the centre of the flower, as in Magnolia, Water-Lily, etc.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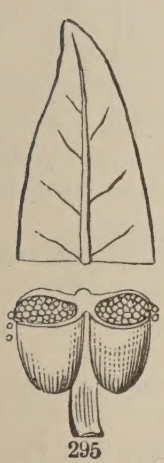
Extrorse, when facing outwardly, as in the Tulip-tree.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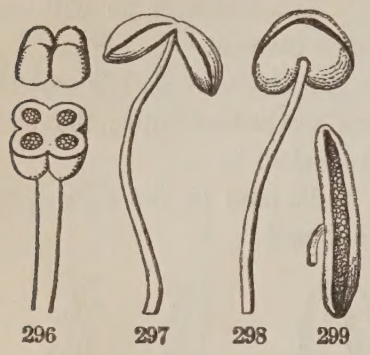
288. Rarely does a stamen bear any resemblance to a leaf, or even to a petal or flower-leaf. Nevertheless, the botanist's idea of a stamen is that it answers to a leaf developed in a peculiar form and for a special purpose. In the filament he sees the stalk of the leaf; in the anther, the blade. The blade of a leaf consists of two similar sides; so the anther consists of two LOBES or CELLS, one answering to the left, the other to the right, side of the blade. The two lobes are often connected by a prolongation of the filament, which answers to the midrib of a leaf; this is called the CONNECTIVE. This is conspicuous in Fig. 292, where the connective is so broad that it separates the two cells of the anther to some distance.

289. A simple conception of the morphological relation of an anther to a leaf is given in Fig. 295, an ideal figure, the lower part representing a stamen with the top of its anther cut away; the upper, the corresponding upper part of a leaf.

FIG. 292. Stamen of Isopyrum, with innate anther. 293. Of Tulip-tree, with adnate (and extrorse) anther. 294. Of Evening Primrose, with versatile anther.

FIG. 295. Diagram of the lower part of an anther, cut across above, and the upper part of a leaf, to show how the one answers to the other; the filament to petiole, the connective to midrib; the two cells to the right and left halves of the blade.

290. So anthers are generally *two-celled.* But as the pollen begins to form in two parts of each cell (the anterior and the posterior), sometimes these two strata are not confluent, and the anther even at maturity may be *four-celled,* as in Moonseed (Fig. 296); or rather, in that case (the word *cell* being used for each lateral half of the organ), it is *two-celled,* but the cells *bilocellate.*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291. But anthers may become *one-celled,* and that either by confluence or by suppression.

292. By confluence, when the two cells run together into one, as they nearly do in most species of Pentstemon (Fig. 297), more so in Monarda (Fig. 300), and completely in the Mallow (Fig. 298) and all the Mallow family.

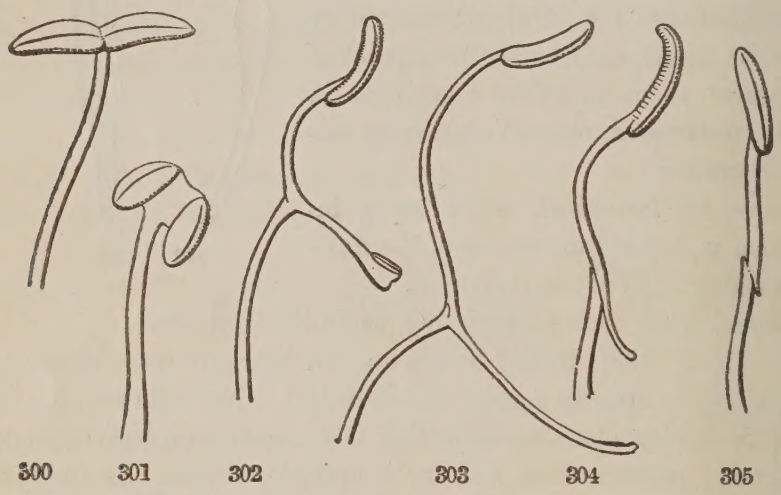
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FIG. 296. Stamen of Moonseed, with anther cut across; this 4-celled, or rather 4-locellate.

FIG. 297. Stamen of Pentstemon pubescens; the two anther-cells diverging, and almost confluent.

FIG. 298. Stamen of Mallow; the anther supposed to answer to that of Fig. 297, but the cells completely confluent into one.

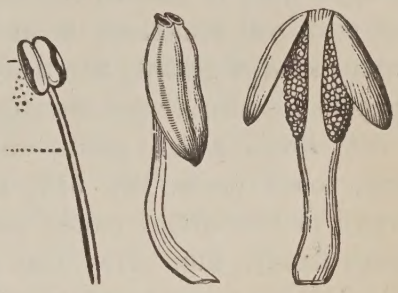
FIG. 299. Stamen of Globe Amaranth; very short filament bearing a single anther-cell; it is open from top to bottom, showing the pollen within.

FIG. 300–305. Stamens of several plants of the Labiate or Mint Family. FIG. 300. Of a Monarda: the two anther-cells with bases divergent so that they are transverse to the filament, and their contiguous tips confluent, so as to form one cell opening by a continuous line. FIG. 301. Of a Calamintha: the broad connective separating the two cells. FIG. 302. Of a Sage (Salvia Texana; with long and slender connective resembling forks of the filament, one bearing a good anther-cell; the other an abortive or poor one. FIG. 303. Another Sage (S. coccinea), with connective longer and more thread-shaped, the lower fork having its anther-cell wholly wanting. FIG. 304. Of a White Sage, Audibertia grandiflora; the lower fork of connective a mere vestige. FIG. 305. Of another White Sage (A. stachyoides), the lower fork of connective suppressed.

293. By suppression in certain cases the anther may be reduced to one cell or halved. In Globe Amaranth (Fig. 299) there is a single cell without vestige of any other. Different species of Sage and of the White Sages of California show various grades of abortion of one of the anther-cells, along with a singular lengthening of the connective (Fig. 302–305).

294. The splitting open of an anther for the discharge of its pollen is termed its *Dehiscence.*

295. As the figures show, this is commonly by a line along the whole length of each cell, either lateral or, when the anthers are extrorse, often along the outer face, and when introrse, along the inner face of each cell. Sometimes the opening is only by a chink, hole, or pore at the top, as in the Azalea, Pyrola (Fig. 307), etc.; sometimes a part of the face separates as a sort of trap-door (or valve), hinged at the top, and opening to allow the escape of the pollen, as in the Sassafras, Spice-bush, and Barberry (Fig. 308).



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296. **Pollen.** This is the powdery matter, commonly of a yellow color, which fills the cells of the anther, and is discharged during blossoming,

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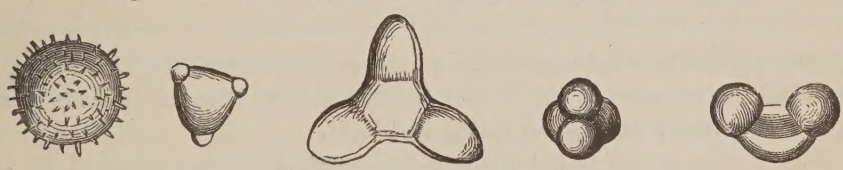
after which the stamens generally fall or wither away. Under the microscope it is found to consist of grains, usually round or oval, and all alike in the same species, but very different in different plants. So that the



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plant may sometimes be recognized from the pollen alone. Several forms are shown in the accompanying figures.

FIG. 306. Stamen with the usual dehiscence of anther down the side of each cell.

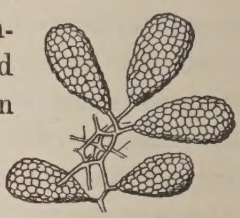
FIG. 307. Stamen of Pyrola; cells opening by a terminal hole.

FIG. 308. Stamen of Barberry; cells of anther each opening by an uplifted valve.

FIG. 309. Magnified pollen of a Lily, smooth and oval; 310, of Echinocystis, grooved lengthwise; 311, of Sicyos, with bristly points and smooth bands; 312, of Musk Plant (Mimulus), with spiral grooves; 313, of Succory, twelve-sided and dotted.

FIG. 314. Magnified pollen of Hibiscus and other Mallow-plants, beset with prickly projections; 315, of Circæa, with angles bearing little lobes; 316, of Even-

297. An ordinary pollen-grain has two coats; the outer coat thickish, but weak, and frequently adorned with lines or bands, or studded with points; the inner coat is extremely thin and delicate, but extensible, and its cavity when fresh contains a thickish protoplasmic fluid, often rendered turbid by an immense number of minute particles that float in it. As the pollen matures this fluid usually dries up, but the protoplasm does not lose its vitality. When the grain is wetted it absorbs water, swells up, and is apt to burst, discharging the contents. But when weak syrup is used it absorbs this slowly, and the tough inner coat will sometimes break through the outer and begin a kind of growth, like that which takes place when the pollen is placed upon the stigma.



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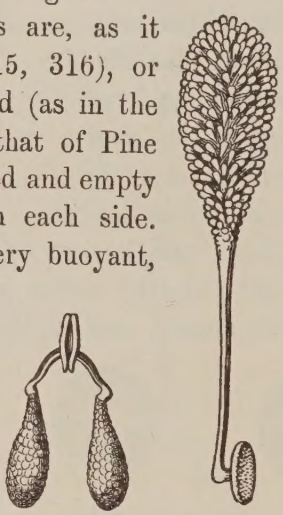
298. Some pollen-grains are, as it were, lobed (as in Fig. 315, 316), or formed of four grains united (as in the Heath family, Fig. 317): that of Pine (Fig. 318) has a large rounded and empty bladder-like expansion upon each side. This renders such pollen very buoyant, and capable of being transported to a great distance by the wind.



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299. In species of Acacia simple grains lightly cohere into globular pellets. In Milkweeds and in most Orchids all the pollen of an anther-cell is compacted or coherent into one mass, called a *Pollen-mass*, or POLLINIUM, plural POLLINIA. (Fig. 319–322.)

319

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ing Primrose, the three lobes as large as the central body; 317, of Kalmia, four grains united, as in most of the Heath family; 318, of Pine, as it were of three grains or cells united; the lateral empty and light.

FIG. 319. Pollen, a pair of pollinia of a Milkweed, Asclepias, attached by stalks to a gland; moderately magnified.

FIG. 320. Pollinium of an Orchis (Habenaria), with its stalk attached to a sticky gland; magnified. 321. Some of the packets or partial pollinia, of which Fig. 320 is made up, more magnified.

FIG. 322. One of the partial pollinia, torn up at top to show the grains (which are each composed of four), and highly magnified.

Section X. PISTILS IN PARTICULAR.

§ 1. ANGIOSPERMOUS OR ORDINARY GYNŒCIUM.

300. **Gynœcium** is the technical name for the pistil or pistils of a flower taken collectively, or for whatever stands in place of these. The various modifications of the gynœcium and the terms which relate to them require particular attention.

301. The Pistil, when only one, occupies the centre of the flower; when there are two pistils, they stand facing each other in the centre of the flower; when several, they commonly form a ring or circle; and when very numerous, they are generally crowded in rows or spirals on the surface of a more or less enlarged or elongated receptacle. Their number gives rise to certain terms, the counterpart of those used for stamens (284), which are survivals of the names of orders in the Linnæan artificial system. The names were coined by prefixing Greek numerals to *-gynia* used for gynœcium, and changed into adjectives in the form of *-gynous*. That is, a flower is

Monogynous, when it has a single pistil, whether that be simple or compound;

Digynous, when it has only two pistils; *Trigynous*, when with three; *Tetragynous*, with four; *Pentagynous*, with five; *Hexagynous*, with six; and so on to *Polygynous*, with many pistils.

302. **The Parts of a Complete Pistil**, as already twice explained (16, 236), are the Ovary, the Style, and the Stigma. The ovary is one essential part: it contains the rudiments of seeds, called Ovules. The stigma at the summit is also essential: it receives the pollen, which fertilizes the ovules in order that they may become seeds. But the style, commonly a tapering or slender column borne on the summit of the ovary, and bearing the stigma on its apex or its side, is no more necessary to a pistil than the filament is to the stamen. Accordingly, there is no style in many pistils: in these the stigma is *sessile*, that is, rests directly on the ovary (as in Fig. 326). The stigma is very various in shape and appearance, being sometimes a little knob (as in the Cherry, Fig. 271), sometimes a point or small surface of bare tissue (as in Fig. 327-330), and sometimes a longitudinal crest or line (as in Fig. 324, 341–343), or it may occupy the whole length of the style, as in Fig. 331.

303. The word Pistil (Latin, *Pistillum*) means a pestle. It came into use in the first place for such flowers as those of Crown Imperial, or Lily, in which the pistil in the centre was likened to the pestle, and the perianth around it to the mortar, of the apothecary.

304. A pistil is either *simple* or *compound*. It is simple when it answers to a single flower-leaf, compound when it answers to two or three, or a fuller circle of such leaves conjoined.

305. **Carpels.** It is convenient to have a name for each flower-leaf of the gynœcium; so it is called a *Carpel*, in Latin *Carpellum* or *Carpidium*. A simple pistil is a carpel. Each component flower-leaf of a compound pistil is likewise a carpel. When a flower has two or more pistils, these of course are simple pistils, that is, separate carpels or pistil-leaves. There may be only a single simple pistil to the flower, as in a Pea or Cherry blossom (Fig. 271); there may be two such, as in many Saxifrages; or many, as in the Strawberry. More commonly the single pistil in the centre of a blossom is a compound one. Then there is seldom much difficulty in ascertaining the number of carpels or pistil-leaves that compose it.

306. **The Simple Pistil,** viewed morphologically, answers to a leaf-blade with margins incurved and united where they meet, so forming a closed case or pod (the ovary), and bearing ovules at the suture or junction of these margins: a tapering upper portion with margins similarly inrolled, is supposed to form the style; and these same margins, exposed at the tip or for a portion of the length, become the stigma. Compare, under this view, the three accompanying figures.

307. So a simple pistil should have a one-celled ovary, only one line of attachment for the ovules, a single style, and a single stigma. Certain variations from this normal condition which sometimes occur do not invalidate this morphological conception. For instance, the stigma may become two-lobed or two-ridged, because it consists of two leaf-margins, as Fig. 324 shows; it may become 2-locellate by the turning or growing inward of one of the sutures, so as to divide the cavity.

323 324 325

308. There are two or three terms which primarily relate to the parts of a simple pistil or carpel, and are thence carried on to the compound pistil, viz.: —

Ventral Suture, the line which answers to the united margins of the carpel-leaf, therefore naturally called a suture or seam, and the ventral or inner one, because in the circle of carpel-leaves it looks inward or to the centre of the flower.

Dorsal Suture is the line down the back of the carpel, answering to

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Fig. 323. An inrolled small leaf, such as in double-flowered Cherry blossoms is often seen to occupy the place of a pistil.

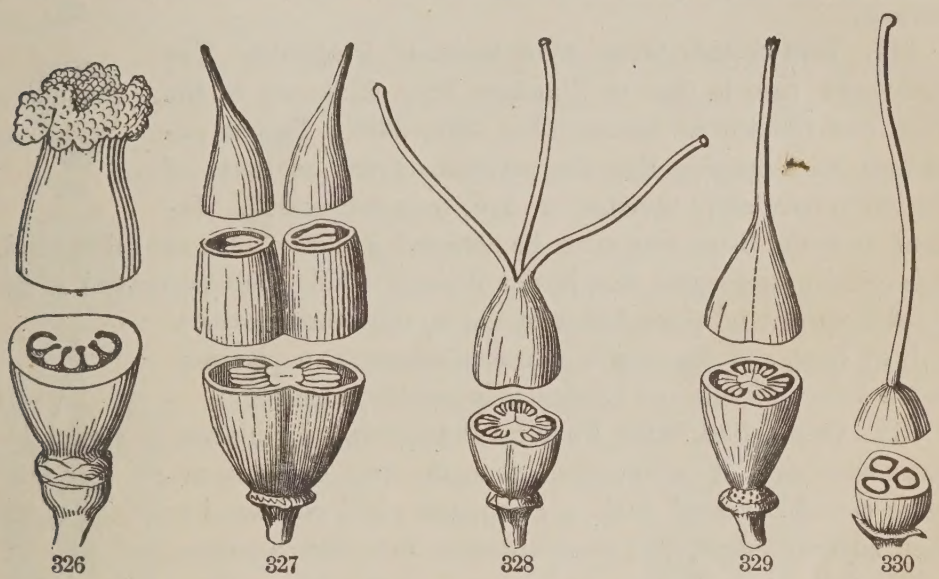
Fig. 324. A simple pistil (of Isopyrum), with ovary cut across; the inner (ventral) face turned toward the eye: the ovules seem to be borne on the ventral suture, answering to leaf-margins: the stigma above seen also to answer to leaf-margins.

Fig. 325. Pod or simple pistil of Caltha or Marsh-Marigold, which has opened, and shed its seeds.

the midrib of the leaf, — not a seam therefore; but at maturity many fruits, such as pea-pods, open by this dorsal as well as by the ventral line.

Placenta, a name given to the surface, whatever it be, which bears the ovules and seeds. The name may be needless when the ovules grow directly on the ventral suture, or from its top or bottom; but when there are many ovules there is usually some expansion of an ovule-bearing or seed-bearing surface; as is seen in our Mandrake or Podophyllum, Fig. 326.

309. **A Compound Pistil** is a combination of two, three, or a greater number of pistil-leaves or carpels in a circle, united into one body, at least



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by their ovaries. The annexed figures should make it clear. A series of Saxifrages might be selected the gynœcium of which would show every gradation between two simple pistils, or separate carpels, and their complete coalescence into one compound and two-celled ovary. Even when the constituent styles and stigmas are completely coalescent into one, the nature of the combination is usually revealed by some external lines or grooves, or (as in Fig. 328–330) by the internal partitions, or the number of the placentæ. The simplest case of compound pistil is that

310. **With two or more Cells and Axile Placentæ**, namely, with as many cells as there are carpels, that have united to compose the organ.

Fig. 326. Simple pistil of Podophyllum, cut across, showing ovules borne on placenta.

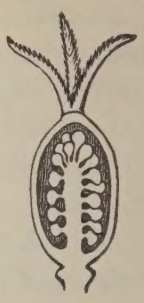
Fig. 327. Pistil of a Saxifrage, of two simple carpels or pistil-leaves, united at the base only, cut across both above and below.

Fig. 328. Compound 3-carpellary pistil of common St. John's-wort, cut across: the three styles separate.

Fig. 329. The same of shrubby St. John's-wort; the three styles as well as ovaries here united into one.

Fig. 330. Compound 3-carpellary pistil of Tradescantia or Spiderwort; the three stigmas as well as styles and ovary completely coalescent into one.

Such a pistil is just what would be formed if the simple pistils (two, three, or five in a circle, as the case may be), like those of a Pæony or Stonecrop (Fig. 224, 225), pressed together in the centre of the flower, were to cohere by their contiguous parts. In such a case the placentæ are naturally *axile*, or all brought together in the axis or centre; and the ovary has as many DISSEPIMENTS, or internal *Partitions*, as there are carpels in its composition. For these are the contiguous and coalescent walls or sides of the component carpels. When such pistils ripen into pods, they often separate along these lines into their elementary carpels.



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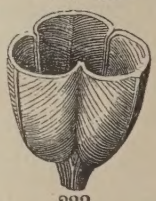
311. **One-celled, with free Central Placenta.** The commoner case is that of Purslane (Fig. 272) and of the Pink and Chickweed families (Fig. 331, 332). This is explained by supposing that the partitions (such as those of Fig. 329) have early vanished or have been suppressed. Indeed, traces of them may often be detected in Pinks. On the other hand, it is equally supposable that in the Primula family the free central is derived from parietal placentation by the carpels bearing ovules only at base, and forming a consolidated common placenta in the axis. Mitella and Dionæa help out this conception.

332

312. **One-celled, with Parietal Placentæ.** In this not uncommon case it is conceived that the two or three or more carpel-leaves of such a compound pistil coalesce by their adjacent edges, just as sepal-leaves do to form a gamosepalous calyx, or petals to form a gamopetalous corolla, and as is shown in the diagram, Fig. 333, and in an actual cross-section, Fig. 334. Here each carpel is an open leaf, or with some introflexion, bearing ovules along its margins; and each placenta consists of the con-



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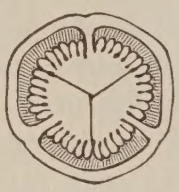

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FIG. 331, 332. Pistil of a Sandwort, with vertical and transverse section of the ovary: free central placenta.

FIG. 333. Plan of a one-celled ovary of three carpel-leaves, with parietal placentæ, cut across below, where it is complete; the upper part showing the top of the three leaves it is composed of, approaching, but not united.

FIG. 334. Cross section of the ovary of Frost-weed (Helianthemum), with three parietal placentæ, bearing ovules.

FIG. 335. Cross section of an ovary of Hypericum graveolens, the three large placentæ meeting in the centre, so as to form a three-celled ovary. 336. Same in fruit, the placentæ now separate and rounded.

tiguous margins of two pistil-leaves grown together. There is every gradation between this and the three-celled ovary with the placentæ in the axis, even in the same genus, sometimes even in different stages in the same pistil (Fig. 335, 336).

§ 2. GYMNOSPERMOUS GYNŒCIUM.

313. The ordinary pistil has a closed ovary, and accordingly the pollen can act upon the contained ovules only indirectly, through the stigma. This is expressed in a term of Greek derivation, viz.: —

Angiospermous, meaning that the seeds are borne in a sac or closed vessel. The counterpart term is

Gymnospermous, meaning naked-seeded. This kind of pistil, or gynœcium, the simplest of all, yet the most peculiar, characterizes the Pine family and its relatives.

314. While the ordinary simple pistil is conceived by the botanist to be a leaf rolled together into a closed pod (306), those of the Pine, Larch (Fig. 337), Cedar, and Arbor-Vitæ (Fig. 338, 339) are open leaves, in the form of scales, each bearing two or more ovules on the inner face, next the base. At the time of blossoming, these pistil-leaves of the young cone diverge, and the pollen, so abundantly shed from the staminate blossoms, falls directly upon the exposed ovules. Afterward the scales close over each other until the seeds are ripe. Then they separate that the seeds may be shed. As the pollen acts directly on the ovules, such pistil (or organ acting as pistil) has no stigma.

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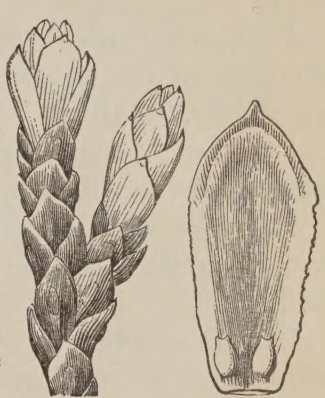

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315. In the Yew, and in Torreya and Gingko, the gynœcium is reduced to extremest simplicity, that is, to a naked ovule, without any visible carpel.

316. In Cycas the large naked ovules are borne on the margins or lobes of an obvious open leaf. All GYMNOSPERMOUS plants have other peculiarities, also distinguishing them, as a class, from ANGIOSPERMOUS plants.

FIG. 337. A pistil, that is, a scale of the cone, of a Larch, at the time of flowering; inside view, showing its pair of naked ovules.

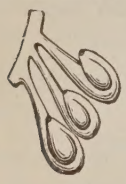
FIG. 338. Branchlet of the American Arbor-Vitæ, considerably larger than in nature, terminated by its pistillate flowers, each consisting of a single scale (an open pistil), together forming a small cone.

FIG. 339. One of the scales or carpels of the last, removed and more enlarged, the inside exposed to view, showing a pair of ovules on its base.

SECTION XI. OVULES.

317. **Ovule** (from the Latin, meaning a little egg) is the technical name of that which in the flower answers to and becomes the seed.

318. Ovules are *naked* in gymnospermous plants (as just described); in all others they are enclosed in the ovary. They may be produced along the whole length of the cell or cells of the ovary, and then they are apt to be numerous; or only from some part of it, generally the top or the bottom. In this case they are usually few or single (*solitary*, as in Fig. 341–343). They may be *sessile*, i. e. without stalk, or they may be attached by a distinct stalk, the FUNICLE or FUNICULUS (Fig. 340).



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319. Considered as to their position and direction in the ovary, they are *Horizontal*, when they are neither turned upward nor downward, as in Podophyllum (Fig. 326);

Ascending, when rising obliquely upwards, usually from the side of the cell, not from its very base, as in the Buttercup (Fig. 341), and the Purslane (Fig. 272);

Erect, when rising upright from the very base of the cell, as in the Buckwheat (Fig. 342);

Pendulous, when hanging from the side or from near the top, as in the Flax (Fig. 270); and

Suspended, when hanging perpendicularly from the very summit of the cell, as in the Anemone (Fig. 343). All these terms equally apply to seeds.

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320. In structure an ovule is a pulpy mass of tissue, usually with one or two coats or coverings. The following parts are to be noted; viz: —

KERNEL or NUCLEUS, the body of the ovule. In the Mistletoe and some related plants, there is only this nucleus, the coats being wanting.

TEGUMENTS, or coats, sometimes only one, more commonly two. When two, one has been called PRIMINE, the other SECUNDINE. It will serve all purposes to call them simply outer and inner ovule-coats.

ORIFICE, or FORAMEN, an opening through the coats at the organic apex of the ovule. In the seed it is *Micropyle*.

CHALAZA, the place where the coats and the kernel of the ovule blend.

HILUM, the place of junction of the funiculus with the body of the ovule.

FIG. 340. A cluster of ovules, pendulous on their funicles.

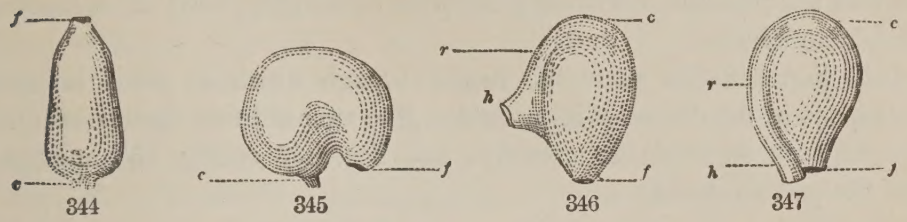
FIG. 341. Section of the ovary of a Buttercup, lengthwise, showing its ascending ovule.

FIG. 342. Section of the ovary of Buckwheat, showing the erect ovule.

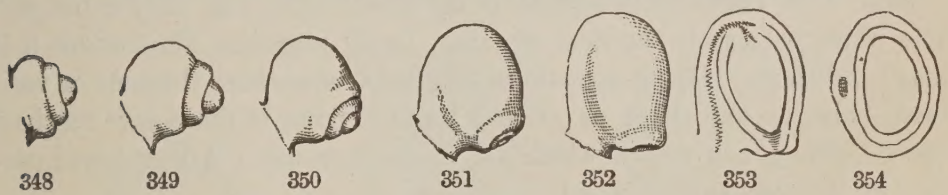
FIG. 343. Section of the ovary of Anemone, showing its suspended ovule.

321. **The Kinds of Ovules.** The ovules in their growth develop in three or four different ways, and thereby are distinguished into

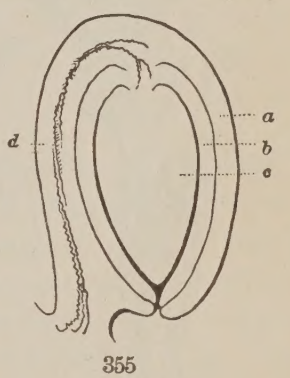
Orthotropous or *Straight*, those which develop without curving or turning, as in Fig. 344. The chalaza is at the insertion or base; the foramen or orifice is at the apex. This is the simplest, but the least common kind of ovule.



Campylotropous or *Incurved*, in which, by the greater growth of one side, the ovule curves into a kidney-shaped outline, so bringing the orifice down close to the base or chalaza; as in Fig. 345.



Amphitropous or *Half-Inverted*, Fig. 346. Here the forming ovule, instead of curving perceptibly, keeps its axis nearly straight, and, as it grows, turns round upon its base so far as to become transverse to its funiculus, and adnate to its upper part for some distance. Therefore in this case the attachment of the funiculus or stalk is about the middle, the chalaza is at one end, the orifice at the other.



Anatropous or *Inverted*, as in Fig. 347, the commonest kind, so called because in its growth it has as it were turned over upon its stalk, to which it has continued adnate. The organic base, or chalaza, thus becomes the apparent summit, and the

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Fig. 344. Orthotropous ovule of Buckwheat: *c*, hilum and chalaza; *f*, orifice.

Fig. 345. Campylotropous ovule of a Chickweed: *c*, hilum and chalaza; *f*, orifice.

Fig. 346. Amphitropous ovule of Mallow: *f*, orifice; *h*, hilum; *r*, rhaphe; *c*, chalaza.

Fig. 347. Anatropous ovule of a Violet; the parts lettered as in the last.

Fig. 348–350. Three early stages in the growth of ovule of a Magnolia, showing the forming outer and inner coats, which, even in the later figure have not yet completely enclosed the nucleus; 351, further advanced, and 352, completely anatropous ovule.

Fig. 353. Longitudinal section, and 354, transverse section of 352.

Fig. 355. Same as 353, enlarged, showing the parts in section: *a*, outer coat; *b*, inner coat; *c*, nucleus; *d*, rhaphe.

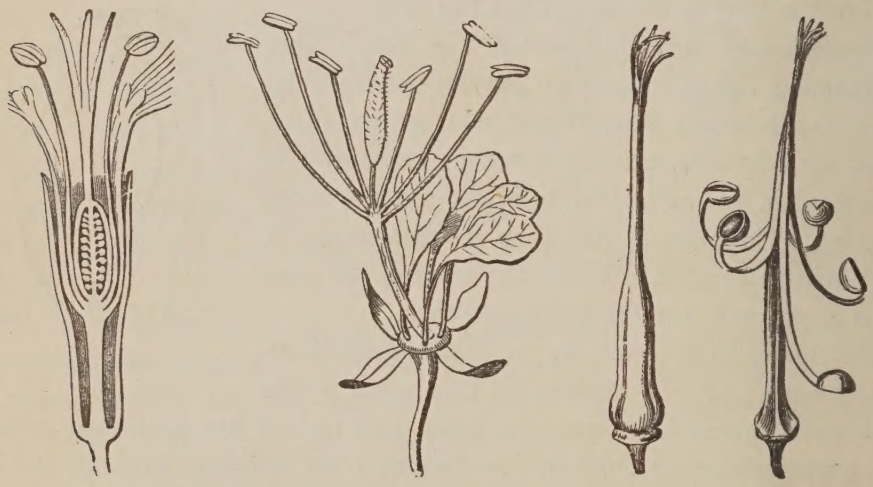
orifice is at the base, by the side of the hilum or place of attachment. The adnate portion of the funiculus, which appears as a ridge or cord extending from the hilum to the chalaza, and which distinguishes this kind of ovule, is called the RHAPHE. The amphitropous ovule (Fig. 346) has a short or incomplete rhaphe.

322. Fig. 348–352 show the stages through which an ovule becomes anatropous in the course of its growth. The annexed two figures are sections of such an ovule at maturity; and Fig. 355 is Fig. 353 enlarged, with the parts lettered.

SECTION XII. MODIFICATIONS OF THE RECEPTACLE.

323. **The Torus** or Receptacle of the flower (237, Fig. 223) is the portion which belongs to the stem or axis. In all preceding illustrations it is small and short. But it sometimes lengthens, sometimes thickens or variously enlarges, and takes on various forms. Some of these have received special names, very few of which are in common use. A lengthened portion of the receptacle is called

A STIPE. This name, which means simply a trunk or stalk, is used in



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botany for various stalks, even for the leaf-stalk in Ferns. It is also applied to the stalk or petiole of a carpel, in the rare cases when there is any, as in

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FIG. 356. Longitudinal section of flower of Silene Pennsylvanica, showing stipe between calyx and corolla.

FIG. 357. Flower of a Cleome of the section Gynandropsis, showing broadened receptacle to bear petals, lengthened stipe below the stamens, and another between these and pistil.

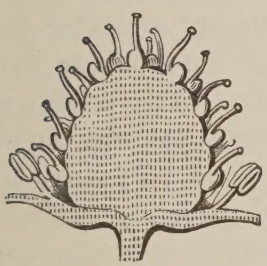
FIG. 358. Pistil of Geranium or Cranesbill.

FIG. 359 The same, ripe, with the five carpels splitting away from the long beak (carpophore), and hanging from its top by their recurving styles.

Goldthread. Then it is technically distinguished as a THECAPHORE. When there is a stalk, or lengthened internode of receptacle, directly under a compound pistil, as in Stanleya and some other Cruciferæ, it is called a GYNOPHORE. When the stalk is developed below the stamens, as in most species of Silene (Fig. 356), it has been called an ANTHOPHORE or GONOPHORE. In Fig. 357 the torus is dilated above the calyx where it bears the petals, then there is a long internode (gonophore) between it and the stamens; then a shorter one (gynophore) between these and the pistil.

324. **A Carpophore** is a prolongation of receptacle or axis between the carpels and bearing them. Umbelliferous plants and Geranium (Fig. 358, 359) afford characteristic examples.

325. Flowers with very numerous simple pistils generally have the receptacle enlarged so as to give them room; sometimes becoming broad and flat, as in the Flowering Raspberry, sometimes elongated, as in the Black-



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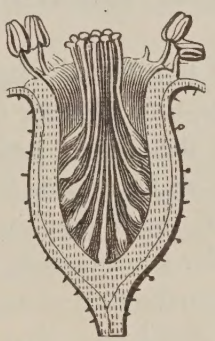

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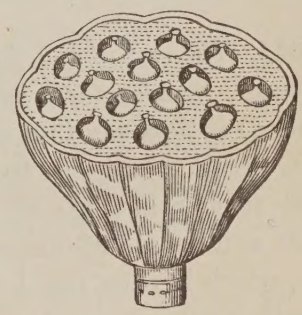

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berry, the Magnolia, etc. It is the receptacle in the Strawberry (Fig. 360), much enlarged and pulpy when ripe, which forms the eatable part of the fruit, and bears the small seed-like pistils on its surface. In the Rose (Fig. 361), instead of being convex or conical, the receptacle is deeply concave, or urn-shaped. Indeed, a Rose-hip may be likened to a strawberry turned inside out, like the finger of a glove reversed, and the whole covered by the adherent tube of the calyx. The calyx remains beneath in the strawberry.

326. In Nelumbium, of the Water-Lily family, the singular and greatly enlarged receptacle is shaped like a top, and bears the small pistils immersed in separate cavities of its flat upper surface (Fig. 362).

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327. **A Disk** is an enlarged low receptacle or an outgrowth from it, *hypogynous* when underneath the pistil, as in Rue and the Orange (Fig. 363), and *perigynous* when adnate to calyx-tube (as in Buckthorn, Fig. 364, 365), and Cherry (Fig. 271), or

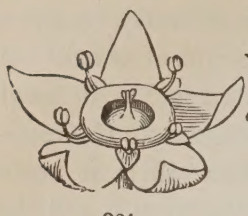
FIG. 360. Longitudinal section of a young strawberry, enlarged.

FIG. 361. Similar section of a young Rose-hip.

FIG. 362. Enlarged and top-shaped receptacle of Nelumbium, at maturity.

FIG. 363. Hypogynous disk in Orange.

to both calyx-tube and ovary, as in Hawthorn (Fig. 273). A flattened hypogynous disk, underlying the ovary or ovaries, and from which they fall away at maturity, is sometimes called a GYNOBASE, as in the Rue family. In some Borragineous flowers, such as Houndstongue, the gynobase runs up in the centre between the carpels into a carpophore. The so-called *epigynous* disk (or STYLOPODIUM) crowning the summit of the ovary in flowers of Umbelliferæ, etc., cannot be said to belong to the receptacle.



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SECTION XIII. FERTILIZATION.

328. The end of the flower is attained when the ovules become seeds. A flower remains for a certain time (longer or shorter according to the species) in *anthesis*, that is, in the proper state for the fulfilment of this end. During anthesis, the ovules have to be fertilized by the pollen; or at least some pollen has to reach the stigma, or in gymnospermy the ovule itself, and to set up the peculiar growth upon its moist and permeable tissue, which has for result the production of an embryo in the ovules. By this the ovules are said to be *fertilized*. The first step is *pollination*, or, so to say, the sowing of the proper pollen upon the stigma, where it is to germinate.

§ 1. ADAPTATIONS FOR POLLINATION OF THE STIGMA.

329. These various and ever-interesting adaptations and processes are illustrated in the "Botanical Text Book, Structural Botany," chap. VI. sect. iv., also in a brief and simple way in "Botany for Young People, How Plants Behave." So mere outlines only are given here.

330. Sometimes the application of pollen to the stigma is left to chance, as in dicœcious wind-fertilized flowers; sometimes it is rendered very sure, as in flowers that are fertilized in the bud; sometimes the pollen is prevented from reaching the stigma of the same flower, although placed very near to it, but then there are always arrangements for its transference to the stigma of some other blossom of the kind. It is among these last that the most exquisite adaptations are met with.

331. Accordingly, some flowers are particularly adapted to close or self-fertilization; others to cross fertilization; some for either, according to circumstances.

FIG. 364. Flower of a Buckthorn showing a conspicuous perigynous disk.
FIG. 365. Vertical section of same flower.

Close Fertilization occurs when the pollen reaches and acts upon a stigma of the very same flower (this is also called self-fertilization), or, less closely, upon other blossoms of the same cluster or the same individual plant.

Cross Fertilization occurs when ovules are fertilized by pollen of other individuals of the same species.

Hybridization occurs when ovules are fertilized by pollen of some other (necessarily some nearly related) species.

332. **Close Fertilization** would seem to be the natural result in ordinary hermaphrodite flowers; but it is by no means so in all of them. More commonly the arrangements are such that it takes place only after some opportunity for cross fertilization has been afforded. But close fertilization is inevitable in what are called

Cleistogamous Flowers, that is, in those which are fertilized in the flower-bud, while still unopened. Most flowers of this kind, indeed, never open at all; but the closed floral coverings are forced off by the growth of the precociously fertilized pistil. Common examples of this are found in the earlier blossoms of Specularia perfoliata, in the later ones of most Violets, especially the stemless species, in our wild Jewel weeds or Impatiens, in the subterranean shoots of Amphicarpæa. Every plant which produces these cleistogamous or bud-fertilized flowers bears also more conspicuous and open flowers, usually of bright colors. The latter very commonly fail to set seed, but the former are prolific.

333. **Cross Fertilization** is naturally provided for in dicœcious plants (249), is much favored in monœcious plants (249), and hardly less so in dichogamous and in heterogonous flowers (338). Cross fertilization depends upon the transportation of pollen; and the two principal agents of conveyance are winds and insects. Most flowers are in their whole structure adapted either to the one or to the other.

334. **Wind-fertilizable or Anemophilous** flowers are more commonly dicœcious or monœcious, as in Pines and all coniferous trees, Oaks, and Birches, and Sedges; yet sometimes hermaphrodite, as in Plantains and most Grasses; they produce a superabundance of very light pollen, adapted to be wind-borne; and they offer neither nectar to feed winged insects, nor fragrance nor bright colors to attract them.

335. **Insect-fertilizable or Entomophilous** flowers are those which are sought by insects, for pollen or for nectar, or for both. Through their visits pollen is conveyed from one flower and from one plant to another. Insects are attracted to such blossoms by their bright colors, or their fragrance, or by the nectar (the material of honey) there provided for them. While supplying their own needs, they carry pollen from anthers to stigmas and from plant to plant, thus bringing about a certain amount of cross fertilization. Willows and some other dicœcious flowers are so fertilized, chiefly by bees. But most insect-visited flowers have the stamens and pistils associated either in the same or in contiguous blossoms. Even when in the same blossom, anthers and stigmas are very commonly so situated

that under insect-visitation, some pollen is more likely to be deposited upon other than upon own stigmas, so giving a chance for cross as well as for close fertilization. On the other hand, numerous flowers, of very various kinds, have their parts so arranged that they must almost necessarily be cross-fertilized or be barren, and are therefore dependent upon the aid of insects. This aid is secured by different exquisite adaptations and contrivances, which would need a volume for full illustration. Indeed, there is a good number of volumes devoted to this subject.[1]

336. Some of the adaptations which favor or ensure cross fertilization are peculiar to the particular kind of blossom. Orchids, Milkweeds, Kalmia, Iris, and papilionaceous flowers each have their own special contrivances, quite different for each.

337. Irregular flowers (253) and especially irregular corollas are usually adaptations to insect-visitation. So are all *Nectaries*, whether hollow spurs, sacs, or other concavities in which nectar is secreted, and all *nectariferous glands*.

338. Moreover, there are two arrangements for cross fertilization common to hermaphrodite flowers in various different families of plants, which have received special names, *Dichogamy* and *Heterogony*.

339. **Dichogamy** is the commoner case. Flowers are *dichogamous* when the anthers discharge their pollen either before or after the stigmas of that flower are in a condition to receive it. Such flowers are

Proterandrous, when the anthers are earlier than the stigmas, as in Gentians, Campanula, Epilobium, etc.

Proterogynous, when the stigmas are mature and moistened for the reception of pollen, before the anthers of that blossom are ready to supply it, and are withered before that pollen can be supplied. Plantains or Ribworts (mostly wind-fertilized) are strikingly proterogynous: so is Amorpha, our Papaws, Scrophularia, and in a less degree the blossom of Pears, Hawthorns, and Horse-chestnut.

340. In Sabbatia, the large-flowered species of Epilobium, and strikingly in Clerodendron, the dichogamy is supplemented and perfected by movements of the stamens and style, one or both, adjusted to make sure of cross fertilization.

341. **Heterogony.** This is the case in which hermaphrodite and fertile flowers of two sorts are produced on different individuals of the same species; one sort having higher anthers and lower stigmas, the other having higher stigmas and lower anthers. Thus reciprocally disposed, a visiting insect carries pollen from the high anthers of the one to the high stigma of the other, and from the low anthers of the one to the low stigma of the other. These plants are practically as if diœcious, with the advantage that

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[1] Beginning with one by C. C. Sprengel in 1793, and again in our day with Darwin, "On the Various Contrivances by which Orchids are fertilized by Insects," and in succeeding works.

both kinds are fruitful. Houstonia and Mitchella, or Partridge-berry, are excellent and familiar examples. These are cases of

Heterogone Dimorphism, the relative lengths being only short and long reciprocally.

Heterogone Trimorphism, in which there is a mid-length as well as a long and a short set of stamens and style; occurs in Lythrum Salicaria and some species of Oxalis.

342. There must be some essential advantage in cross fertilization or cross breeding. Otherwise all these various, elaborate, and exquisitely adjusted adaptations would be aimless. Doubtless the advantage is the same as that which is realized in all the higher animals by the distinction of sexes.

§ 2. ACTION OF POLLEN, AND FORMATION OF THE EMBRYO.

343. Pollen-growth. A grain of pollen may be justly likened to one of the simple bodies (*spores*) which answer for seeds in Cryptogamous plants. Like one of these, it is capable of germination. When deposited upon the moist surface of the stigma (or in some cases even when at a certain distance) it grows from some point, its living inner coat breaking through the inert outer coat, and protruding in the form of a delicate tube. This as it lengthens penetrates the loose tissue of the stigma and of a loose conducting tissue in the style, feeds upon the nourishing liquid matter there provided, reaches the cavity of the ovary, enters the orifice of an ovule, and attaches its extremity to a sac, or the lining of a definite cavity, in the ovule, called the *Embryo-Sac*.

344. Origination of the Embryo. A globule of living matter in the embryo-sac is formed, and is in some way placed in close proximity to the apex of the pollen tube; it probably absorbs the contents of the latter; it then sets up a special growth, and the *Embryo* (8–10) or rudimentary plantlet in the seed is the result.

SECTION XIV. THE FRUIT.

345. Its Nature. The ovary matures into the Fruit. In the strictest sense the fruit is the seed-vessel, technically named the PERICARP. But practically it may include other parts organically connected with the pericarp. Especially the calyx, or a part of it, is often incorporated with the ovary, so as to be undistinguishably a portion of the pericarp, and it even forms along with the receptacle the whole bulk of such edible fruits as apples and pears. The receptacle is an obvious part in blackberries, and is the whole edible portion in the strawberry.

346. Also a cluster of distinct carpels may, in ripening, be consolidated or compacted, so as practically to be taken for one fruit. Such are raspber-

ries, blackberries, the Magnolia fruit, etc. Moreover, the ripened product of many flowers may be compacted or grown together so as to form a single compound fruit.

347. Its kinds have therefore to be distinguished. Also various names of common use in descriptive botany have to be mentioned and defined.

348. In respect to composition, accordingly, fruits may be classified into

Simple, those which result from the ripening of a single pistil, and consist only of the matured ovary, either by itself, as in a cherry, or with calyx-tube completely incorporated with it, as in a gooseberry or cranberry.

Aggregate, when a cluster of carpels of the same flower are crowded into a mass; as in raspberries and blackberries.

Accessory or *Anthocarpous*, when the surroundings or supports of the pistil make up a part of the mass; as does the loose calyx changed into a fleshy and berry-like envelope of our Wintergreen (Gaultheria, Fig. 366, 367) and Buffalo-berry, which are otherwise simple fruits. In an aggregate fruit such as the strawberry the great mass is receptacle (Fig. 360, 368); and in the blackberry (Fig. 369) the juicy receptacle forms the central part of the savory mass.

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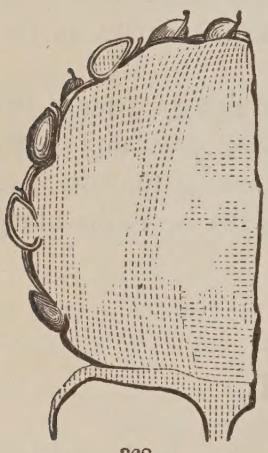
Multiple or *Collective*, when formed from several flowers consolidated into one mass, of which the common receptacle or axis of inflorescence, the floral envelopes, and even the bracts, etc., make a part. A mulberry (Fig. 408, which superficially much resembles a blackberry) is of this multiple sort. A pine-apple is another example.



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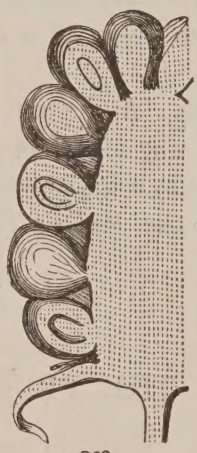

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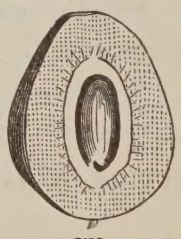

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349. In respect to texture or consistence, fruits may be distinguished into three kinds, viz.: —

Fleshy Fruits, those which are more or less soft and juicy throughout;

FIG. 366. Forming fruit (capsule) of Gaultheria, with calyx thickening around its base. 367. Section of same mature, the berry-like calyx nearly enclosing the capsule.

FIG. 368. Section of a part of a strawberry. Compare with Fig. 360.

FIG. 369. Similar section of part of a blackberry. 370. One of its component simple fruits (drupe) in section, showing the pulp, stone, and contained seed, more enlarged. Compare with Fig. 375.

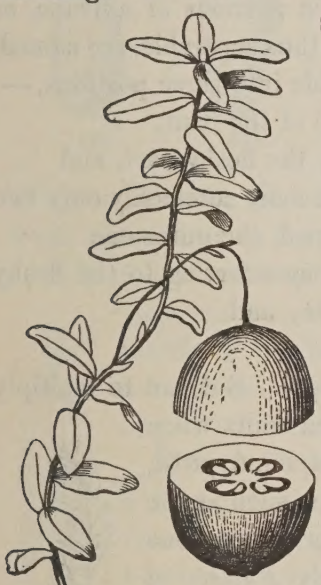
Stone Fruits, or *Drupaceous*, the outer part fleshy like a berry, the inner hard or stony, like a nut; and

Dry Fruits, those which have no flesh or pulp.

350. In reference to the way of disseminating the contained seed, fruits are said to be

Indehiscent when they do not open at maturity. Fleshy fruits and stone fruits are of course indehiscent. The seed becomes free only through decay or by being fed upon by animals. Those which escape digestion are thus disseminated by the latter. Of dry fruits many are indehiscent; and these are variously arranged to be transported by animals. Some burst irregularly; many are

Dehiscent, that is, they split open regularly along certain lines, and discharge the seeds. A dehiscent fruit almost always contains many or several seeds, or at least more than one seed.



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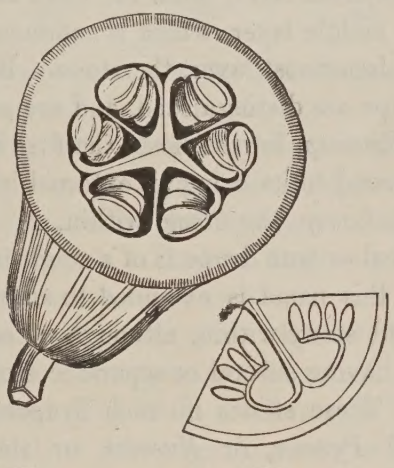

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351. The principal kinds of fruit which have received substantive names and are of common use in descriptive botany are the following. Of fleshy fruits the leading kind is

352. **The Berry**, such as the gooseberry and currant, the blueberry and cranberry (Fig. 371), the tomato, and the grape. Here the whole flesh is soft throughout. The orange is a berry with a leathery rind.

353. **The Pepo**, or *Gourd-fruit*, is a hard-rinded berry, belonging to the Gourd family, such as the pumpkin, squash, cucumber, and melon, Fig. 372, 373.

354. **The Pome** is a name applied to the apple, pear (Fig. 374), and quince; fleshy fruits, like a berry, but the principal thickness is calyx, only

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FIG. 371. Leafy shoot and berry (cut across) of the larger Cranberry, Vaccinium macrocarpon.

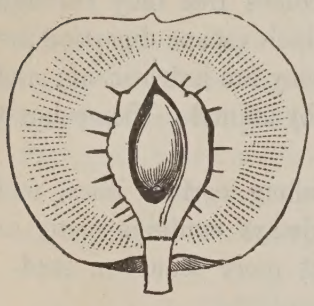
FIG. 372. Pepo of Gourd, in section. 373. One carpel of same in diagram.

FIG. 374. Longitudinal and transverse sections of a pear (pome).

the papery pods arranged like a star in the core really belonging to the carpels. The fruit of the Hawthorn is a drupaceous pome, something between pome and drupe.

355. Of fruits which are externally fleshy and internally hard the leading kind is

356. **The Drupe**, or *Stone-fruit;* of which the cherry, plum, and peach (Fig. 375) are familiar examples. In this the outer part of the thickness of the pericarp becomes fleshy, or softens like a berry, while the inner hardens, like a nut. From the way in which the pistil is constructed, it is evident that the fleshy part here answers to the lower, and the stone to the upper face of the component leaf. The layers or concentric portions of a drupe, or of any pericarp which is thus separable, are named, when thus distinguishable into three portions, —



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Epicarp, the external layer, often the mere skin of the fruit,

Mesocarp, the middle layer, which is commonly the fleshy part, and

Endocarp, the innermost layer, the stone. But more commonly only two portions of a drupe are distinguished, and are named, the outer one

Sarcocarp or *Exocarp*, for the flesh, the first name referring to the fleshy character, the second to its being an external layer; and

Putamen or *Endocarp*, the *Stone*, within.

357. The typical or true drupe is of a single carpel. But, not to multiply technical names, this name is extended to all such fruits when fleshy without and stony within, although of compound pistil, — even to those having several or separable stones, such as the fruit of Holly. These stones in such drupes, or drupaceous fruits, are called *Pyrenæ*, or *Nucules*, or simply *Nutlets* of the drupe.

358. Of Dry fruits, there is a greater diversity of kinds having distinct names. The indehiscent sorts are commonly one-seeded.

359. **The Akene or Achenium** is a small, dry and indehiscent one-seeded fruit, often so seed-like in appearance that it is popularly taken for a naked seed. The fruit of the Butter cup or Crowfoot is a good example, Fig. 376, 377. Its nature, as a ripened pistil (in this

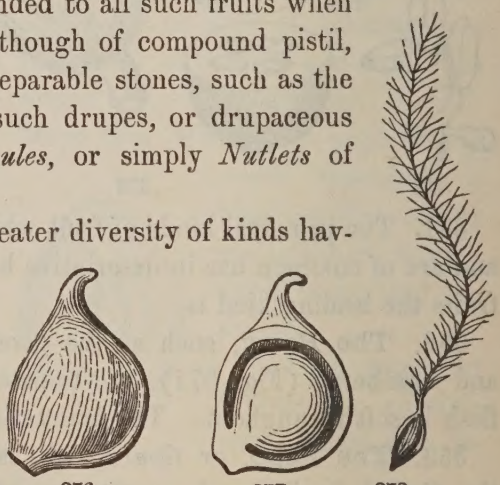

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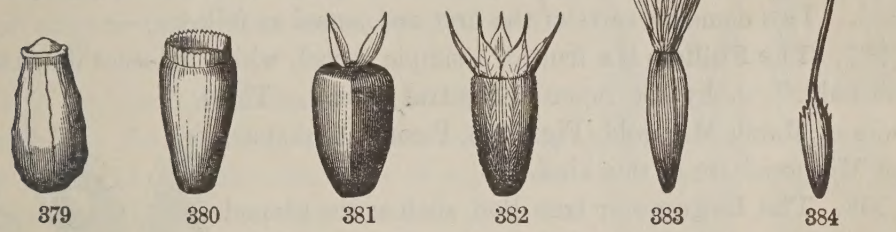
FIG. 375. Longitudinal section of a peach, showing flesh, stone, and seed.

FIG. 376. Akene of a Buttercup. 377. The same, divided lengthwise, to show the contained seed.

FIG. 378. Akene of Virgin's-bower, retaining the feathered style, which aids in dissemination.

case a simple carpel), is apparent by its bearing the remains of a style or stigma, or a scar from which this has fallen. It may retain the style and use it in various ways for dissemination (Fig. 378).

360. The fruit of Compositæ (though not of a single carpel) is also an akene. In this case the pericarp is invested by an adherent calyx-tube; the limb of which, when it has any, is called the PAPPUS. This name was first given to the down like that of the Thistle, but is applied to all forms under which the limb of the calyx of the "compound flower" appears. In Lettuce, Dandelion (Fig. 384), and the like, the achenium as it matures tapers upwards into a slender beak, like a stalk to the pappus.



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361. **A Cremocarp** (Fig. 385), a name given to the fruit of Umbelliferæ, consists as it were of a pair of akenes united completely in the blossom, but splitting apart when ripe into the two closed carpels. Each of these is a *Mericarp* or *Hemicarp*, names seldom used.

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362. **A Utricle** is the same as an akene, but with a thin and bladdery loose pericarp; like that of the Goosefoot or Pigweed (Fig. 386). When ripe it may burst open irregularly to discharge the seed; or it may open by a circular line all round, the upper part falling off like a lid; as in the Amaranth (Fig. 387).

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363. **A Caryopsis, or Grain**, is like an akene with the seed adhering to the thin pericarp throughout, so that fruit and seed are incorporated into one body; as in wheat, Indian corn, and other kinds of grain.

364. **A Nut** is a dry and indehiscent fruit, commonly one-celled and one-

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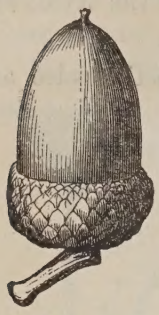
FIG. 379. Akene of Mayweed (no pappus). 380. That of Succory (its pappus a shallow cup). 381. Of Sunflower (pappus of two deciduous scales). 382. Of Sneezeweed (Helenium), with its pappus of five scales. 383. Of Sow-Thistle, with its pappus of delicate downy hairs. 384. Of the Dandelion, its pappus raised on a long beak.

FIG. 385. Fruit (cremocarp) of Osmorrhiza; the two akene-like ripe carpels separating at maturity from a slender axis or carpophorse.

FIG. 386. Utricle of the common Pigweed (Chenopodium album).

FIG. 387. Utricle (pyxis) of Amaranth, opening all round (circumscissile).

seeded, with a hard, crustaceous, or bony wall, such as the cocoanut, hazel-nut, chestnut, and the acorn (Fig. 37, 388.) Here the involucre, in the form of a cup at the base, is called the CUPULE. In the Chestnut the cupule forms the bur; in the Hazel, a leafy husk.



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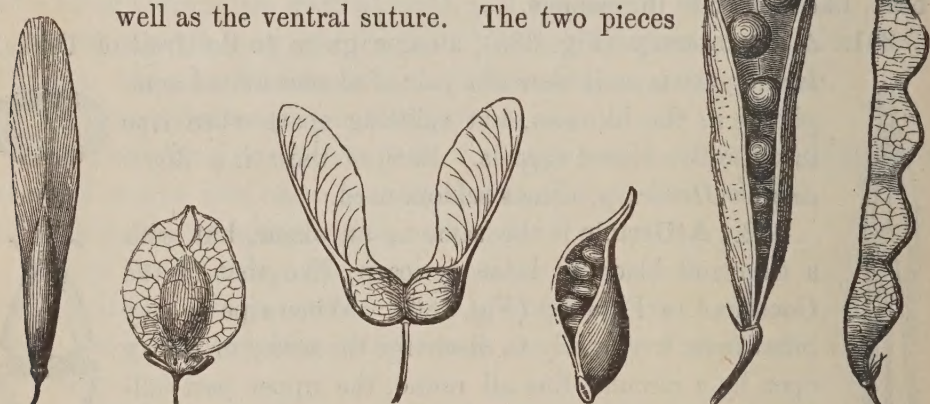
365. **A Samara, or Key-fruit,** is either a nut or an akene, or any other indehiscent fruit, furnished with a wing, like that of Ash (Fig. 389), and Elm (Fig. 390). The Maple-fruit is a pair of keys (Fig. 391).

366. Dehiscent Fruits, or Pods, are of two classes, viz., those of a simple pistil or carpel, and those of a compound pistil. Two common sorts of the first are named as follows: —

367. **The Follicle** is a fruit of a simple carpel, which dehisces down one side only, i. e. by the inner or ventral suture. The fruits of Marsh Marigold (Fig. 392), Pæony, Larkspur, and Milkweed are of this kind.

368. **The Legume** or true Pod, such as the peapod (Fig. 393), and the fruit of the Leguminous or Pulse family generally, is one which opens along the dorsal as well as the ventral suture. The two pieces into which it splits are called VALVES. A LOMENT is a legume which is constricted between the seeds, and at length breaks up crosswise into distinct joints, as in Fig. 394.



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369. The pods or dehiscent fruits belonging to a compound ovary have several technical names: but they all may be regarded as kinds of

370. **The Capsule**, the dry and dehiscent fruit of any compound pistil. The capsule may discharge its seeds through chinks or pores, as in the

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FIG. 388. Nut (acorn) of the Oak, with its cup or cupule.

FIG. 389. Samara or key of the White Ash, winged at end. 390. Samara of the American Elm, winged all round.

FIG. 391. Pair of samaras of Sugar Maple.

FIG. 392. Follicle of Marsh Marigold (Caltha palustris).

FIG. 393. Legume of a Sweet Pea, opened.

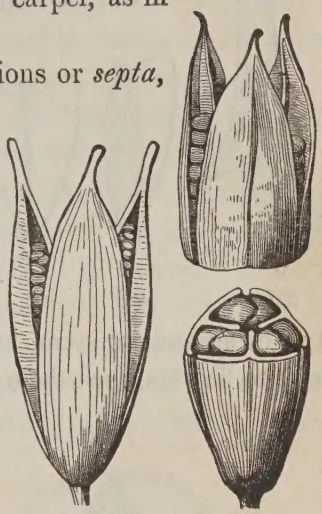
FIG. 394. Loment or jointed legume of a Tick-Trefoil (Desmodium).

Poppy, or burst irregularly in some part, as in Lobelia and the Snapdragon; but commonly it splits open (or is *dehiscent*) lengthwise into regular pieces, called VALVES.

371. Regular *Dehiscence* in a capsule takes place in two ways, which are best illustrated in pods of two or three cells. It is either

Loculicidal, or, splitting directly into the *loculi* or cells, that is, down the back (or the dorsal suture) of each cell or carpel, as in Iris (Fig. 395); or

Septicidal, that is, splitting through the partitions or *septa*, as in St. John's-wort (Fig. 396), Rhododendron, etc. This divides the capsule into its component carpels, which then open by their ventral suture.



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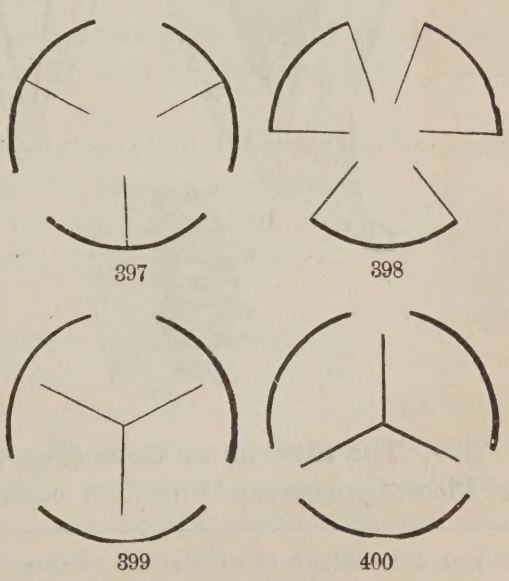
372. In loculicidal dehiscence the valves naturally bear the partitions on their middle; in the septicidal, half the thickness of a partition is borne on the margin of each valve. See the annexed diagrams. A variation of either mode occurs when the valves break away from the partitions, these remaining attached in the axis of the fruit. This is called *Sepifragal* dehiscence. One form is seen in the Morning-Glory (Fig. 400).

373. The capsules of Rue, Spurge, and some others, are both loculicidal and septicidal, and so split into half-carpellary valves or pieces.



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374. **The Silique** (Fig. 401) is the technical name of the peculiar pod of the Mustard family; which is two-celled by a false partition stretched across between two parietal placentæ. It generally opens by two valves from below upward, and the placentæ with the partition are left behind when the valves fall off.

375. **A Silicle or Pouch** is only a short and broad silique, like that of the Shepherd's Purse, Fig. 402, 403.

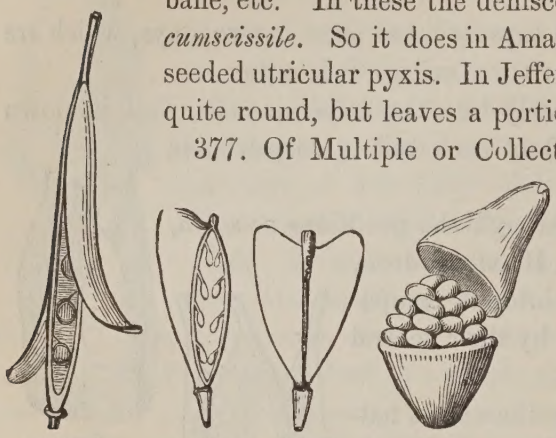
FIG. 395. Capsule of Iris, with loculicidal dehiscence; below, cut across.

FIG. 396. Pod of a Marsh St. John's-wort, with septicidal dehiscence.

FIG. 397, 398. Diagrams of the two modes.

FIG. 399. Diagram of septifragal dehiscence of the loculicidal type. 400. Same of the septicidal or *marginicidal* type.

376. **The Pyxis** is a pod which opens by a circular horizontal line, the upper part forming a lid, as in Purslane (Fig. 404), the Plantain, Henbane, etc. In these the dehiscence extends all round, or is *circumscissile*. So it does in Amaranth (Fig. 387), forming a one-seeded utricular pyxis. In Jeffersonia, the line does not separate quite round, but leaves a portion for a hinge to the lid.



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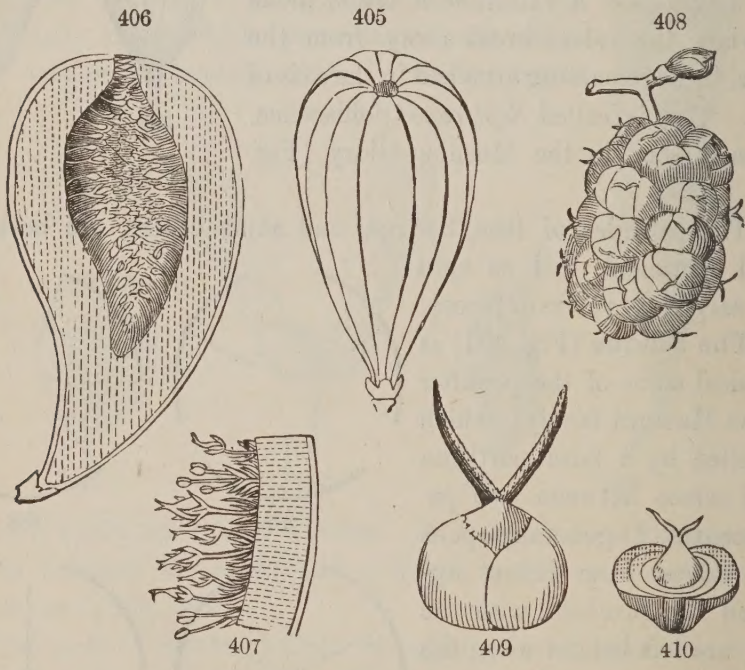
377. Of Multiple or Collective Fruits, which are properly masses of fruits aggregated into one body (as is seen in the Mulberry (Fig. 408), Pine-apple, etc.), there are two kinds with special names and of peculiar structure.

378. **The Syconium or Fig-fruit** (Fig. 405, 406) is a fleshy axis or summit of stem, hollowed out, and lined within by a multitude of minute flowers, the whole becoming pulpy, and in the common fig, luscious.



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379. **The Strobile or Cone** (Fig. 411), is the peculiar multiple fruit of Pines, Cypresses, and the like; hence named *Coniferæ*, viz. cone-bearing

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Fig. 401. Silique of a Cadamine or Spring Cress.

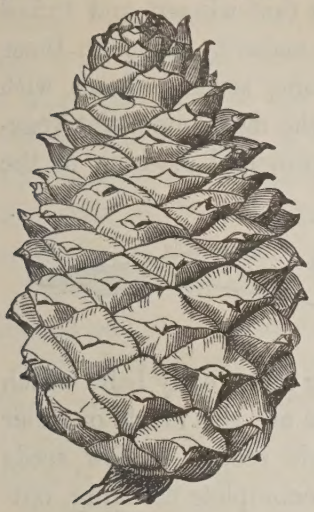
Fig. 402. Silicle of Shepherd's Purse. 403. Same, with one valve removed.

Fig. 404. Pyxis of Purslane, the lid detaching.

Fig. 405. A fig-fruit when young. 406. Same in section. 407. Magnified portion, a slice, showing some of the flowers.

Fig. 408. A mulberry. 409. One of the grains younger, enlarged; seen to be a pistillate flower with calyx becoming fleshy. 410. Same, with fleshy calyx cut across.

plants. As already shown (313), these cones are *open pistils*, mostly in the form of flat scales, regularly overlying each other, and pressed together in a spike or head. Each scale bears one or two naked seeds on its inner face. When ripe and dry, the scales turn back or diverge, and in the Pine the seed peels off and falls, generally carrying with it a wing, a part of the lining of the scale, which facilitates the dispersion of the seeds by the wind (Fig. 412, 413). In Arbor-Vitæ, the scales of the small cone are few, and not very unlike the leaves. In Cypress they are very thick at the top and narrow at the base, so as to make a peculiar sort of closed cone. In Juniper and Red Cedar, the few scales of the very small cone become fleshy, and ripen into a fruit which closely resembles a berry.



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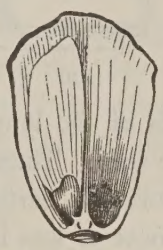

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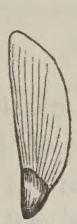

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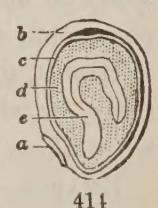
SECTION XV. THE SEED.

380. Seeds are the final product of the flower, to which all its parts and offices are subservient. Like the ovule from which it originates, a seed consists of coats and kernel.

381. **The Seed-coats** are commonly two (320), the outer and the inner. Fig. 414 shows the two, in a seed cut through lengthwise. The outer coat is often hard or crustaceous, whence it is called the *Testa*, or shell of the seed; the inner is almost always thin and delicate.



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382. The shape and the markings, so various in different seeds, depend mostly on the outer coat. Sometimes this fits the kernel closely; sometimes it is expanded into a *wing*, as in the Trumpet-Creeper (Fig. 415), and occasionally this wing is cut up into shreds or tufts, as in the Catalpa (Fig. 416); or instead of a wing it may bear a *Coma*, or tuft of long and soft hairs, as in the Milkweed or Silkweed (Fig. 417). The use of wings, or downy tufts is to render the seeds buoyant

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FIG. 411. Cone of a common Pitch Pine. 412. Inside view of a separated scale or open carpel; one seed in place: 413, the other seed.

FIG. 414. Seed of a Linden or Basswood cut through lengthwise, and magnified, the parts lettered: *a*, the hilum or scar; *b*, the outer coat; *c*, the inner; *d*, the albumen; *e*, the embryo.

for dispersion by the winds. This is clear, not only from their evident adaptation to this purpose, but also from the fact that winged and tufted seeds are found only in fruits that split open at maturity, never in those that remain closed. The coat of some seeds is beset with long hairs or wool. *Cotton*, one of the most important vegetable products, since it forms the principal clothing of the

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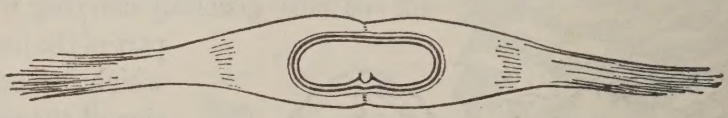

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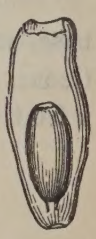
larger part of the human race, consists of the long and woolly hairs which thickly cover the whole surface of the seed. There are also crests or other appendages of various sorts on certain seeds. A few seeds have an additional, but more or less incomplete covering, outside of the real seed-coats called an

417

383. **Aril, or Arillus.** The loose and transparent bag which encloses the seed of the White Water-Lily (Fig. 418) is of this kind. So is the *mace* of the nutmeg; and also the scarlet pulp around the seeds of the Waxwork (Celastrus) and Strawberry-bush (Euonymus). The aril is a growth from the extremity of the seed-stalk, or from the placenta when there is no seed-stalk.



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384. A short and thickish appendage at or close to the hilum in certain seeds is called a CARUNCLE or STROPHIOLE (Fig. 419).

385. The various terms which define the position or direction of the ovule (erect, ascending, etc.) apply equally to the seed: so also the terms anatropous, orthotropous, campylotropous, etc., as already defined (320, 321), and such terms as

419

HILUM, or *Scar* left where the seed-stalk or funiculus falls away, or where the seed was attached directly to the placenta when there is no seed-stalk.

RHAPHE, the line or ridge which runs from the hilum to the chalaza in anatropous and amphitropous seeds.

CHALAZA, the place where the seed-coats and the kernel or nucleus are organically connected, — at the hilum in orthotropous and campylotropous seeds, at the extremity of the rhaphe or tip of the seed in other kinds.

MICROPYLE, answering to the *Foramen* or orifice of the ovule. Compare the accompanying figures and those of the ovules, Fig. 341–355.

FIG. 415. A winged seed of the Trumpet-Creeper.

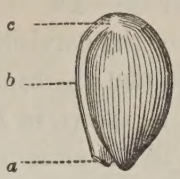
FIG. 416. One of Catalpa, the kernel cut to show the embryo.

FIG. 417. Seed of Milkweed, with a *Coma* or tuft of long silky hairs at one end.

FIG. 418. Seed of White Water-Lily, enclosed in its aril.

FIG. 419. Seed of Ricinus or Castor-oil plant, with caruncle.

386. **The Kernel, or Nucleus,** is the whole body of the seed within the coats. In many seeds the kernel is all *Embryo;* in others a large part of it is the *Albumen.* For example, in Fig. 423, it is wholly embryo; in Fig. 422, all but the small speck (*g*) is albumen.



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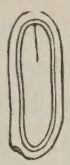
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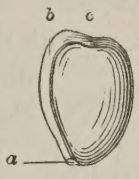

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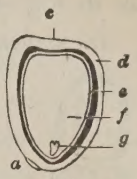

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387. **The Albumen or Endosperm** of the seed is sufficiently characterized and its office explained in Sect. III., 31–35.

388. **The Embryo** or *Germ*, which is the rudimentary plantlet and the final result of blossoming, and its development in germination have been extensively illustrated in Sections II. and III. Its essential parts are the *Radicle* and the *Cotyledons.*

389. **Its Radicle or Caulicle** (the former is the term long and generally used in botanical descriptions, but the latter is the more correct one, for it is the initial stem, which merely gives origin to the root), as to its position in the seed, always points to and lies near the micropyle. In relation to the pericarp it is

Superior, when it points to the apex of the fruit or cell, and

Inferior, when it points to its base, or downward.

424

390. **The Cotyledons** have already been illustrated as respects their number, — giving the important distinction of *Dicotyledonous, Polycotyledonous* and *Monocotyledonous* embryos (36–43), — also as regards their thickness, whether *foliaceous* or *fleshy;* and some of the very various shapes and adaptations to the seed have been figured. They may be straight, or folded, or rolled up. In the latter case the cotyledons may be rolled up as it were from one margin, as in Calycanthus (Fig. 424), or from apex to base in a flat spiral, or they may be both folded (*plicate*) and rolled up (*convolute*), as in Sugar Maple (Fig. 11.) In one very natural family, the Cruciferæ, two different modes prevail in the way the two cotyledons are brought round against the radicle. In one series they are

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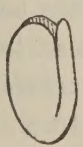
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FIG. 420. Seed of a Violet (anatropous): *a*, hilum; *b*, rhaphe; *c*, chalaza.

FIG. 421. Seed of a Larkspur (also anatropous); the parts lettered as in the last.

FIG. 422. The same, cut through lengthwise: *a*, the hilum; *c*, chalaza; *d*, outer seed-coat; *e*, inner seed-coat; *f*, the albumen; *g*, the minute embryo.

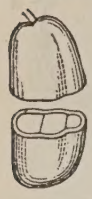
FIG. 423. Seed of a St. John's-wort, divided lengthwise; here the whole kernel is embryo.

FIG. 424. Embryo of Calycanthus; upper part cut away, to show the convolute cotyledons.

FIG. 425. Seed of Bitter Cress, Barbarea, cut across to show the accumbent cotyledons. 426. Embryo of same, whole.

Accumbent, that is, the edges of the flat cotyledons lie against the radicle, as in Fig. 425, 426. In another they are

Incumbent, or with the plane of the cotyledons brought up in the opposite direction, so that the back of one of them lies against the radicle, as shown in Fig. 427, 428.



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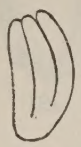

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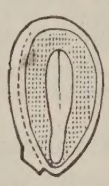
391. As to the situation of the embryo with respect to the albumen of the seed, when this is present in any quantity, the embryo may be *Axile*, that is occupying the axis or centre, either for most of its length, as in Violet (Fig. 429), Barberry (Fig. 48), and Pine (Fig. 56); and in these it is straight. But it may be variously curved or coiled in the albumen, as in Helianthemum (Fig. 430), in a Potato-seed (Fig. 50), or Onion-seed (Fig. 60), and Linden (Fig. 414); or it may be coiled around the outside of the albumen, partly or into a circle, as in Chickweed (Fig. 431, 432) and in Mirabilis (Fig. 52). The latter mode prevails in Campylotropous seeds. In the cereal grains, such as Indian Corn (Fig. 67) and Rice, 430 *a*), and in all other Grasses, the embryo is straight and applied to the outside of the abundant albumen.



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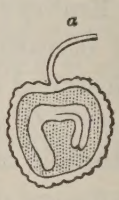

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430 *a*

431

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392. The matured seed, with embryo ready to germinate and reproduce the kind, completes the cycle of the vegetable life in a phanerogamous plant, the account of which began with the seed and seedling.

Section XVI. VEGETABLE LIFE AND WORK.

393. The following simple outlines of the anatomy and physiology of plants (3) are added to the preceding structural part for the better preparation of students in descriptive and systematic botany; also to give to all learners some general idea of the life, growth, intimate structure, and action of the beings which compose so large a part of organic nature. Those who would extend and verify the facts and principles here outlined will use the Physiological Botany of the "Botanical Text Book," by Professor Goodale, or some similar book.

Fig. 427. Seed of a Sisymbrium, cut across to show the incumbent cotyledons. 428. Embryo of the same, detached whole.

Fig. 429. Section of seed of Violet; anatropous with straight axile embryo in the albumen. 430. Section of seed of Rock Rose, Helianthemum Canadense; orthotropous, with curved embryo in the albumen. 430 *a*. Section of a grain of Rice, lengthwise, showing the embryo outside the albumen, which forms the principal bulk.

Fig. 431. Seed of a Chickweed, campylotropous. 432. Section of same, showing slender embryo coiled around the outside of the albumen of the kernel.

§ 1. ANATOMICAL STRUCTURE AND GROWTH.

394. **Growth** *is the increase of a living thing in size and substance.* It appears so natural that plants and animals should grow, that one rarely thinks of it as requiring explanation. It seems enough to say that a thing is so because it grew so. Growth from the seed, the germination and development of an embryo into a plantlet, and at length into a mature plant (as illustrated in Sections II. and III.), can be followed by ordinary observation. But the embryo is already a miniature plantlet, sometimes with hardly any visible distinction of parts, but often one which has already made very considerable growth in the seed. To investigate the formation and growth of the embryo itself requires well-trained eyes and hands, and the expert use of a good compound microscope. So this is beyond the reach of a beginner.

395. Moreover, although observation may show that a seedling, weighing only two or three grains, may double its bulk and weight every week of its early growth, and may in time produce a huge amount of vegetable matter, it is still to be asked what this vegetable matter is, where it came from, and by what means plants are able to increase and accumulate it, and build it up into the fabric of herbs and shrubs and lofty trees.

396. **Protoplasm.** All this fabric was built up under life, but only a small portion of it is at any one time alive. As growth proceeds, life is passed on from the old to the new parts, much as it has passed on from parent to offspring, from generation to generation in unbroken continuity. *Protoplasm* is the common name of that plant-stuff in which life essentially resides. All growth depends upon it; for it has the peculiar power of growing and multiplying and building up a living structure, — the animal no less than the vegetable structure, for it is essentially the same in both. Indeed, all the animal protoplasm comes primarily from the vegetable, which has the prerogative of producing it; and the protoplasm of plants furnishes all that portion of the food of animals which forms their flesh and living fabric.

397. The very simplest plants (if such may specifically be called plants rather than animals, or one may say, the simplest living things) are mere particles, or pellets, or threads, or even indefinite masses of protoplasm of vague form, which possess powers of motion or of changing their shape, of imbibing water, air, and even other matters, and of assimilating these into plant-stuff for their own growth and multiplication. Their growth is increase in substance by incorporation of that which they take in and assimilate. Their multiplication is by spontaneous division of their substance or body into two or more, each capable of continuing the process.

398. The embryo of a phanerogamous plant at its beginning (344) is essentially such a globule of protoplasm, which soon constricts itself into two and more such globules, which hold together inseparably in a row; then the last of the row divides without separation in the two other planes, to

form a compound mass, each grain or globule of which goes on to double itself as it grows; and the definite shaping of this still increasing mass builds up the embryo into its form.

399. Cell-walls. While this growth was going on, each grain of the forming structure formed and clothed itself with a coat, thin and transparent, of something different from protoplasm, — something which hardly and only transiently, if at all, partakes of the life and action. The protoplasm forms the living organism; the coat is a kind of protective covering or shell. The protoplasm, like the flesh of animals which it gives rise to, is composed of four chemical elements: Carbon, Hydrogen, Oxygen, and Nitrogen. The coating is of the nature of wood (is, indeed, that which makes wood), and has only the three elements, Carbon, Hydrogen, and Oxygen, in its composition.

433

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435

400. Although the forming structure of an embryo in the fertilized ovule is very minute and difficult to see, there are many simple plants of lowest grade, abounding in pools of water, which more readily show the earlier stages or simplest states of plant-growth. One of these, which is common in early spring, requires only moderate magnifying power to bring to view what is shown in Fig. 437. In a slimy mass which holds all loosely together, little spheres of green vegetable matter are seen, assembled in fours, and these fours themselves in clusters of fours. A transient inspection shows, what prolonged watching would confirm, that each sphere divides first in one plane, then in the other, to make four, soon acquiring the size of the original, and so on, producing successive groups of fours. These pellets each form on their surface a transparent wall, like that just described. The delicate wall is for some time capable of expansive growth, but is from the first much firmer than the protoplasm within; through it the latter imbibes surrounding moisture, which becomes a watery sap, occupying vacuities in the protoplasmic mass which enlarge or run together as the periphery increases and distends. When full grown the protoplasm may become a mere lining to the wall, or some of it central, as a nucleus, this usually connected with the wall-lining by delicate threads of the same substance. So, when full grown, the wall with its lining — a vesicle, containing liquid or some

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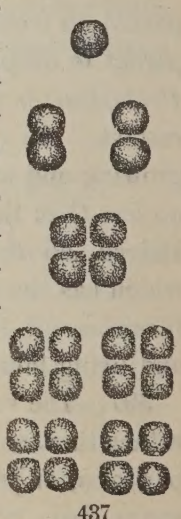
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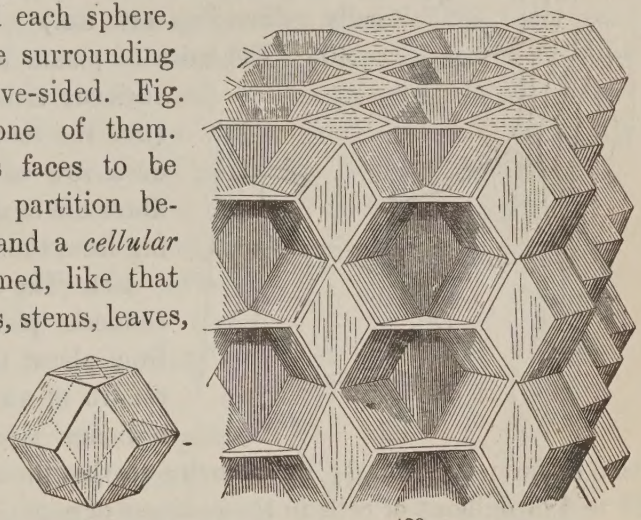
FIG. 433–436. Figures to illustrate the earlier stages in the formation of an embryo; a single mass of protoplasm (Fig. 433) dividing into two, three, and then into more incipient cells, which by continued multiplication build up an embryo.

FIG. 437. Magnified view of some of a simple fresh water Alga, the Tetraspora lubrica, each sphere of which may answer to an individual plant.

solid matters and in age mostly air — naturally came to be named a CELL. But the name was suggested by, and first used only for, cells in combination or built up into a fabric, much as a wall is built of bricks, that is, into a

401. Cellular Structure or Tissue. Suppose numerous cells like those of Fig. 437 to be heaped up like a pile of cannon-balls, and as they grew, to be compacted together while soft and yielding; they would flatten where they touched, and each sphere, being touched by twelve surrounding ones would become twelve-sided. Fig. 438 would represent one of them. Suppose the contiguous faces to be united into one wall or partition between adjacent cavities, and a *cellular structure* would be formed, like that shown in Fig. 439. Roots, stems, leaves, and the whole of phanerogamous plants are a fabric of countless numbers of such cells. No such exact regularity in size and shape is ever actually found; but a nearly truthful magnified view of a small portion of a slice of the flower-stalk of a Calla Lily (Fig. 440) shows a fairly corresponding structure; except that, owing to the great air-spaces of the interior, the fabric may be likened rather to a stack of chimneys than to a solid fabric. In young and partly transparent parts one may discern the cellular structure by looking down directly on the surface, as of a forming root. (Fig. 82, 441, 442).



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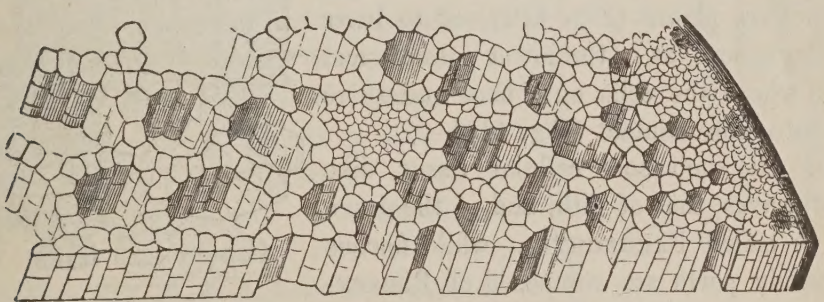


440

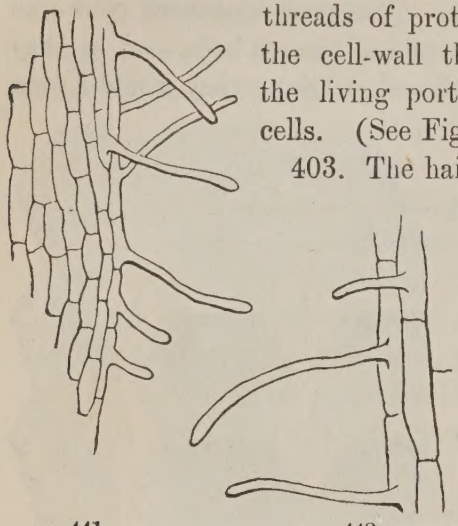
402. The substance of which cell-walls are mainly composed is called CELLULOSE. It is essentially the same in the stem of a delicate leaf or petal and in the wood of an Oak, except that in the latter the walls are

FIG. 438. Diagram of a vegetable cell, such as it would be if when spherical it were equally pressed by similar surrounding cells in a heap.

FIG. 439. Ideal construction of cellular tissue so formed, in section.

FIG. 440. Magnified view of a portion of a transverse slice of stem of Calla Lily. The great spaces are tubular air-channels built up by the cells.

much thickened and the calibre small. The protoplasm of each living cell appears to be completely shut up and isolated in its shell of cellulose; but microscopic investigation has brought to view, in many cases, minute threads of protoplasm which here and there traverse the cell-wall through minute pores, thus connecting the living portion of one cell with that of adjacent cells. (See Fig. 447, &c.)

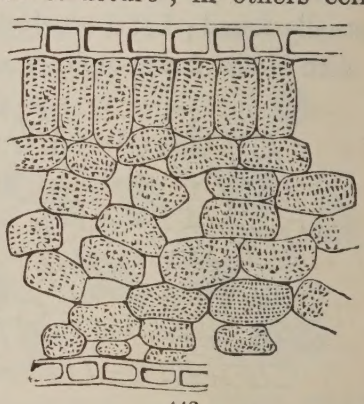


441 442

403. The hairs of plants are cells formed on the surface; either elongated single cells (like the root-hairs of Fig. 441, 442), or a row of shorter cells. Cotton fibres are long and simple cells growing from the surface of the seed.

404. The size of the cells of which common plants are made up varies from about the thirtieth to the thousandth of an inch in diameter. An ordinary size of short or roundish cells is from $\frac{1}{300}$ to $\frac{1}{500}$ of an inch; so that there may generally be from 27 to 125 millions of cells in the compass of a cubic inch!

405. Some parts are built up as a compact structure; in others cells are arranged so as to build up regular air-channels, as in the stems of aquatic and other water-loving plants (Fig. 440), or to leave irregular spaces, as in the lower part of most leaves, where the cells only here and there come into close contact (Fig. 443).



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406. All such soft cellular tissue, like this of leaves, that of pith, and of the green bark, is called PARENCHYMA, while fibrous and woody parts are composed of PROSENCHYMA, that is, of peculiarly transformed

407. Strengthening Cells. Common cellular tissue, which makes up the whole structure of all very young plants, and the whole of Mosses and other vegetables of the lowest grade, even when full grown, is too tender or too brittle to give needful strength and toughness for plants which are to rise to any considerable height and support themselves. In these needful strength is imparted, and the conveyance of sap through the plant is facilitated, by the change, as they are formed, of some cells into thicker-walled and tougher tubes, and by the running together of some of

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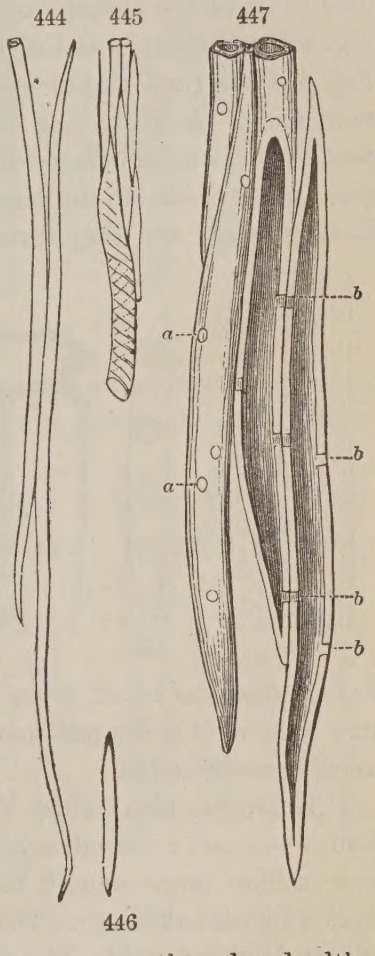
FIG. 441. Much magnified small portion of young root of a seedling Maple (such as of Fig. 82); and 442, a few cells of same more magnified. The prolongations from the back of some of the cells are root-hairs.

FIG. 443. Magnified section through the thickness of a leaf of Florida Star-Anise.

these, or the prolongation of others, into hollow fibres or tubes of various size. Two sorts of such transformed cells go together, and essentially form the

408. **Wood.** This is found in all common herbs, as well as in shrubs and trees, but the former have much less of it in proportion to the softer cellular tissue. It is formed very early in the growth of the root, stem, and leaves, — traces of it appearing in large embryos even while yet in the seed. Those cells that lengthen, and at the same time thicken their walls form the proper WOODY FIBRE or WOOD-CELLS; those of larger size and thinner walls, which are thickened only in certain parts so as to have peculiar markings, and which often are seen to be made up of a row of cylindrical cells, with the partitions between absorbed or broken away, are called DUCTS, or sometimes VESSELS. There are all gradations between wood-cells and ducts, and between both these and common cells. But in most plants the three kinds are fairly distinct.



409. The proper cellular tissue, or *parenchyma*, is the ground-work of root, stem, and leaves; this is traversed, chiefly lengthwise, by the strengthening and conducting tissue, wood-cells and duct-cells, in the form of bundles or threads, which, in the stems and stalks of herbs are fewer and comparatively scattered, but in shrubs and trees so numerrous and crowded that in the stems and all permanent parts they make a solid mass of wood. They extend into and ramify in the leaves, spreading out in a horizontal plane, as the framework of ribs and veins, which supports the softer cellular portion or parenchyma.

410. **Wood-Cells, or Woody Fibres,** consist of tubes, commonly between one and two thousandths, but in Pine-wood sometimes two or three hundredths, of an inch in diameter. Those from the tough bark of the Basswood,

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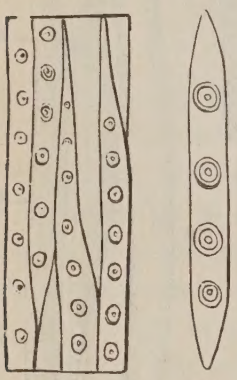
FIG. 444. Magnified wood-cells of the bark (bast-cells) of Basswood, one and part of another. 445. Some wood-cells from the wood (and below part of a duct); and 446, a detached wood-cell of the same; equally magnified.

FIG. 447. Some wood-cells from Buttonwood, Platanus, highly magnified, a whole cell and lower end of another on the left; a cell cut half away lengthwise, and half of another on the right; some pores or pits (*a*) seen on the left; while *b b* mark sections through these on the cut surface. When living and young the protoplasm extends into these and by minuter perforations connects across them. In age the pits become open passages, facilitating the passage of sap and air

shown in Fig. 444, are only the fifteen-hundredth of an inch wide. Those of Buttonwood (Fig. 447) are larger, and are here highly magnified besides. The figures show the way wood-cells are commonly put together, namely, with their tapering ends overlapping each other, — spliced together, as it were, — thus giving more strength and toughness. In hard woods, such as Hickory and Oak, the walls of these tubes are very thick, as well as dense; while in soft woods, such as White-Pine and Basswood, they are thinner.

411. Wood-cells in the bark are generally longer, finer, and tougher than those of the proper wood, and appear more like fibres. For example, Fig. 446 represents a cell of the wood of Basswood of average length, and Fig. 444 one (and part of another) of the fibrous bark, both drawn to the same scale. As these long cells form the principal part of fibrous bark, or *bast*, they are named *Bast-cells* or *Bast-fibres*. These give the great toughness and flexibility to the inner bark of Basswood (i. e. Bast-wood) and of Leatherwood; and they furnish the invaluable fibres of flax and hemp; the proper wood of their stems being tender, brittle, and destroyed by the processes which separate for use the tough and slender bast-cells. In Leatherwood (Dirca) the bast-cells are remarkably slender. A view of one, if magnified on the scale of Fig. 444, would be a foot and a half long.



448 449 450

412. The wood-cells of Pines, and more or less of all other Coniferous trees, have on two of their sides very peculiar disk-shaped markings (Fig. 448–450) by which that kind of wood is recognizable.

413. **Ducts**, also called VESSELS, are mostly larger than wood-cells: indeed, some of them, as in Red Oak, have calibre large enough to be discerned on a cross section by the naked eye. They make the visible porosity of such kinds of wood. This is particularly the case with *Dotted* ducts (Fig. 451, 452), the surface of which appears as if riddled with round or oval pores. Such ducts are commonly made up of a row of large cells more or less confluent into a tube.

Scalariform ducts (Fig. 458, 459), common in Ferns, and generally angled by mutual pressure in the bundles,

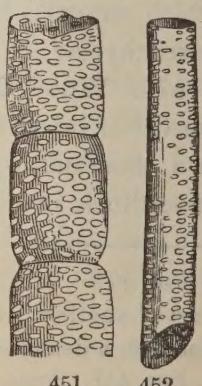
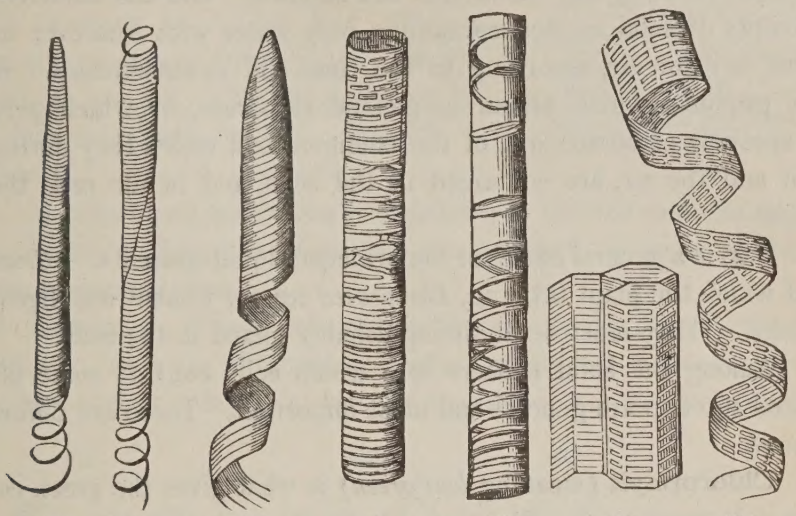

451 452

FIG. 448. Magnified bit of a pine-shaving, taken parallel with the silver grain. 449. Separate whole wood-cell, more magnified. 450. Same, still more magnified; both sections represented: *a*, disks in section, *b*, in face.

FIG. 451, 452. A large and a smaller dotted duct from Grape-Vine.

have transversely elongated thin places, parallel with each other, giving a ladder-like appearance, whence the name.

Annular ducts (Fig. 457) are marked with cross lines or rings, which are thickened portions of the cell-wall.



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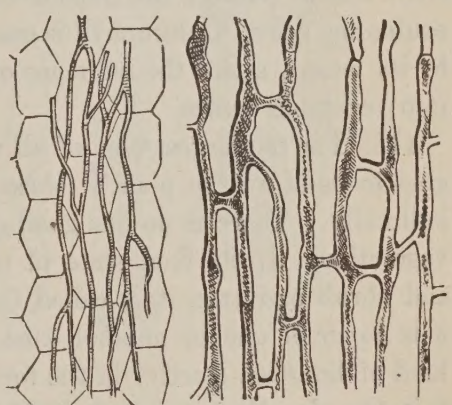
Spiral ducts or vessels (Fig. 453–455) have thin walls, strengthened by a spiral fibre adherent within. This is as delicate and as strong as spider-web: when uncoiled by pulling apart, it tears up and annihilates the cell-wall. The uncoiled threads are seen by gently pulling apart many leaves, such as those of Amaryllis, or the stalk of a Strawberry leaflet.



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Laticiferous ducts, Vessels of the Latex, or Milk-vessels are peculiar branching tubes which hold *latex* or milky juice in certain plants. It is very difficult to see them, and more so to make out their nature. They are peculiar in branching and inosculating, so as to make a net-work of tubes, running in among the cellular tissue; and they are very small, except when gorged and old (Fig. 460, 461).

Fig. 453, 454. Spiral ducts which uncoil into a single thread. 455. Spiral duct which tears up as a band. 456. An annular duct, with variations above. 457. Loose spiral duct passing into annular. 458. Scalariform ducts of a Fern; part of a bundle, prismatic by pressure. 459. One torn into a band.

Fig. 460. Milk Vessels of Dandelion, with cells of the common cellular tissue. 461. Others from the same older and gorged with milky juice. All highly magnified.

§ 2. CELL-CONTENTS.

414. The living contents of young and active cells are mainly protoplasm with water or watery sap which this has imbibed. Old and effete cells are often empty of solid matter, containing only water with whatever may be dissolved in it, or air, according to the time and circumstances. All the various products which plants in general elaborate, or which particular plants specially elaborate, out of the common food which they derive from the soil and the air, are contained in the cells, and in the cells they are produced.

415. **Sap** is a general name for the principal liquid contents, —*Crude sap*, for that which the plant takes in, *Elaborated sap* for what it has digested or assimilated. They must be undistinguishably mixed in the cells.

416. Among the solid matters into which cells convert some of their elaborated sap two are general and most important. These are *Chlorophyll* and *Starch*.

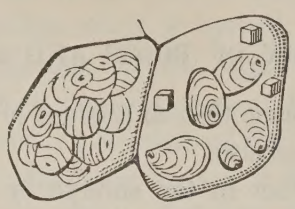
417. **Chlorophyll** (meaning *leaf-green*) is what gives the green color to herbage. It consists of soft grains of rather complex nature, partly wax-like, partly protoplasmic. These abound in the cells of all common leaves and the green rind of plants, wherever exposed to the light. The green color is seen through the transparent skin of the leaf and the walls of the containing cells. Chlorophyll is essential to ordinary assimilation in plants: by its means, under the influence of sunlight, the plant converts crude sap into vegetable matter.

418. Far the largest part of all vegetable matter produced is that which goes to build up the plant's fabric or cellular structure, either directly or indirectly. There is no one good name for this most important product of vegetation. In its final state of cell-walls, the permanent fabric of herb and shrub and tree, it is called *Cellulose* (408): in its most soluble form it is *Sugar* of one or another kind; in a less soluble form it is *Dextrine*, a kind of liquefied starch: in the form of solid grains stored up in the cells it is *Starch*. By a series of slight chemical changes (mainly a variation in the water entering into the composition), one of these forms is converted into another.

419. **Starch** (*Farina* or *Fecula*) is the form in which this common plant material is, as it were, laid by for future use. It consists of solid grains, somewhat different in form in different plants, in size varying from $\frac{1}{300}$ to $\frac{1}{4000}$ of an inch, partly translucent when wet, and of a pearly lustre. From the concentric lines, which commonly appear under the microscope, the grains seem to be made up of layer over layer. When loose they are commonly oval, as in potato-starch (Fig. 462): when much compacted the grains may become angular (Fig. 463).

420. The starch in a potato was produced in the foliage. In the soluble form of dextrine, or that of sugar, it was conveyed through the cells of the herbage and stalks to a subterranean shoot, and there stored up in the

tuber. When the potato sprouts, the starch in the vicinity of developing buds or eyes is changed back again, first into mucilaginous dextrine, then into sugar, dissolved in the sap, and in this form it is made to flow to the growing parts, where it is laid down into cellulose or cell-wall.



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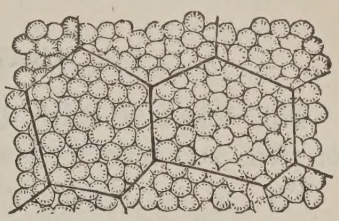

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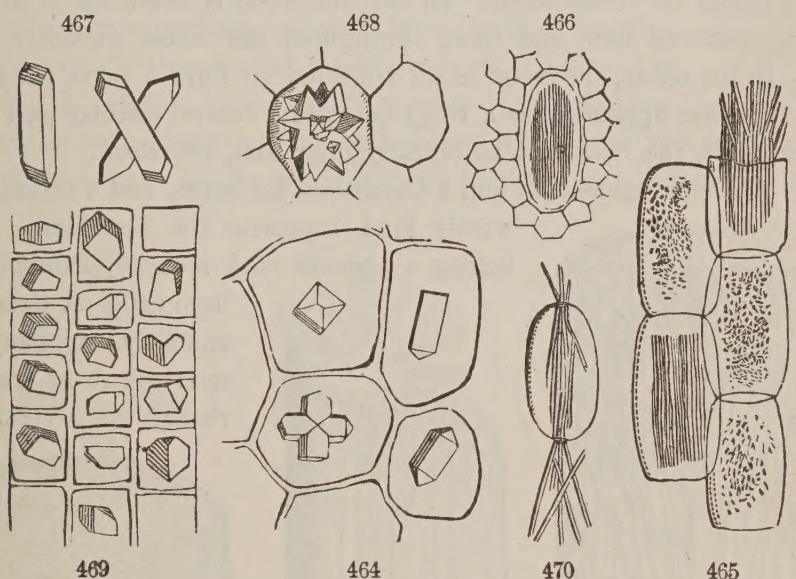
421. Besides these cell-contents which are in obvious and essential relation to nutrition, there are others the use of which is problematical. Of such the commonest are

422. Crystals. These when slender or needle-shaped are called Rhaphides. They are of inorganic matter, usually of oxalate or phosphate or sulphate of lime. Some, at least of the latter, may be direct crystalliza-



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tions of what is taken in dissolved in the water absorbed, but others must be the result of some elaboration in the plant. Some plants have hardly any; others abound in them, especially in the foliage and bark. In Locust-bark almost every cell holds a crystal; so that in a square inch not thicker than writing-paper there may be over a million and a half of them. When

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Fig. 462. Some magnified starch-grains, in two cells of a potato. 463. Some cells of the albumen or floury part of Indian Corn, filled with starch-grains.

Fig. 464. Four cells from dried Onion-peel, each holding a crystal of different shape, one of them twinned. 465. Some cells from stalk of Rhubarb-plant, three containing chlorophyll; two (one torn across) with rhaphides. 466. Rhaphides in a cell, from Arisæma, with small cells surrounding. 467. Prismatic crystals from the bark of Hickory. 468. Glomerate crystal in a cell, from Beet-root. 469. A few cells of Locust-bark, a crystal in each. 470. A detached cell, with rhaphides being forced out, as happens when put in water.

needle-shaped (rhaphides), as in stalks of Calla-Lily, Rhubarb, or Four-o'clock, they are usually packed in sheaf-like bundles. (Fig. 465, 466.)

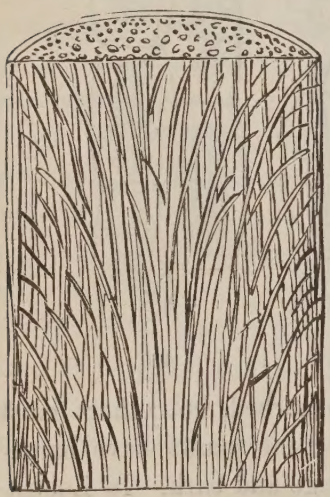
§ 3. ANATOMY OF ROOTS AND STEMS.

423. This is so nearly the same that an account of the internal structure of stems may serve for the root also.

424. At the beginning, either in the embryo or in an incipient shoot from a bud, the whole stem is of tender cellular tissue or parenchyma. But wood (consisting of wood-cells and ducts or vessels) begins to be formed in the earliest growth; and is from the first arranged in two ways, making two general kinds of wood. The difference is obvious even in herbs, but is more conspicuous in the enduring stems of shrubs and trees.

425. On one or the other of these two types the stems of all phanerogamous plants are constructed. In one, the wood is made up of separate threads, scattered here and there throughout the whole diameter of the stem. In the other, the wood is all collected to form a layer (in a slice across the stem appearing as a ring) between a central cellular part which has none in it, the *Pith*, and an outer cellular part, the *Bark*.

426. An Asparagus-shoot and a Corn-stalk for herbs, and a rattan for a woody kind, represent the first kind. To it belong all plants with monocotyledonous embryo (40). A Bean-stalk and the stem of any common shrub or tree represent the second; and



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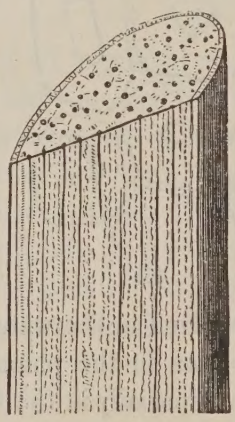

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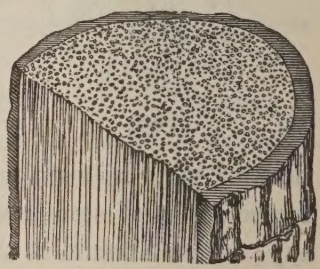

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to it belong all plants with dicotyledonous or polycotyledonous embryo. The first has been called, not very properly, *Endogenous*, which means inside-growing; the second, properly enough, *Exogenous*, or outside-growing.

427. **Endogenous Stems**, those of Monocotyls (40), attain their greatest size and most characteristic development in Palms and Dragon-trees, therefore chiefly in warm climates, although the Palmetto and some

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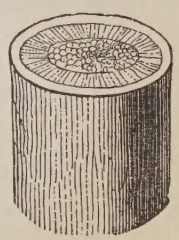
FIG. 471. Diagram of structure of Palm or Yucca. 472. Structure of a Corn-stalk, in transverse and longitudinal section. 473. Same of a small Palm-stem. The dots on the cross sections represent cut ends of the woody bundles or threads.

Yuccas become trees along the southern borders of the United States. In such stems the woody bundles are more numerous and crowded toward the circumference, and so the harder wood is outside; while in an exogenous stem the oldest and hardest wood is toward the centre. An endogenous stem has no clear distinction of pith, bark, and wood, concentrically arranged, no silver grain, no annual layers, no bark that peels off clean from the wood. Yet old stems of Yuccas and the like, that continue to increase in diameter, do form a sort of layers and a kind of scaly bark when old. Yuccas show well the curving of the woody bundles (Fig. 471) which below taper out and are lost at the rind.

428. **Exogenous Stems**, those of Dicotyls (37), or of plants coming from dicotyledonous and also polycotyledonous embryos, have a structure which is familiar in the wood of our ordinary trees and shrubs. It is the same in an herbaceous shoot (such as a Flax-stem, Fig. 474) as in a Maple-stem of the first year's growth, except that the woody layer is commonly thinner or perhaps reduced to a circle of bundles. It was so in the tree-stem at the beginning. The wood all forms in a cylinder, — in cross section a ring — around a central cellular part, dividing the cellular core within, the pith, from a cellular bark without. As the wood-bundles increase in number and in size,



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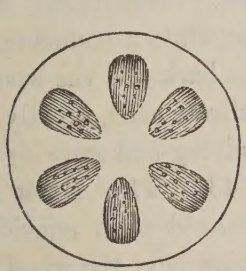

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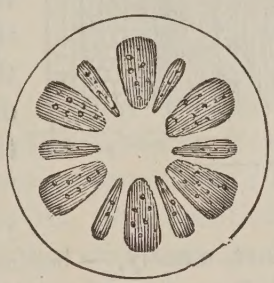

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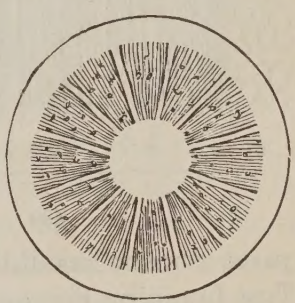

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they press upon each other and become wedge-shaped in the cross section; and they continue to grow from the outside, next the bark, so that they become very thin wedges or plates. Between the plates or wedges are very thin plates (in cross section lines) of much compressed cellular tissue, which connect the pith with the bark. The plan of a one-year-old woody stem of this kind is exhibited in the figures, which are essentially diagrams.

429. When such a stem grows on from year to year, it adds annually a

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FIG. 474. Short piece of stem of Flax, magnified, showing the bark, wood, and pith in a cross section.

FIG. 475. Diagram of a cross section of a very young exogenous stem, showing six woody bundles or wedges. 476. Same later, with wedges increased to twelve. 477. Still later, the wedges filling the space, separated only by the thin lines, or medullary rays, running from pith to bark.

layer of wood outside the preceding one, between that and the bark. This is exogenous growth, or outside-growing, as the name denotes.

430. Some new bark is formed every year, as well as new wood, the former inside, as the latter is outside of that of the year preceding. The ring or zone of tender forming tissue between the bark and the wood has been called the *Cambium Layer*. *Cambium* is an old name of the physiologists for nutritive juice. And this thin layer is so gorged with rich nutritive sap when spring growth is renewed, that the bark then seems to be loose from the wood and a layer of viscid sap (or *cambium*) to be poured out between the two. But there is all the while a connection of the bark and the wood by delicate cells, rapidly multiplying and growing.

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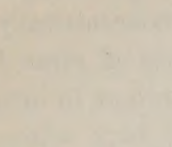

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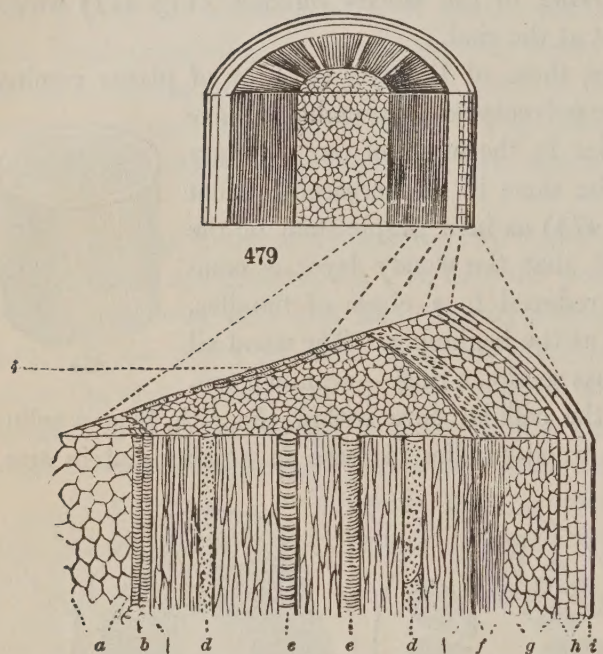

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431. **The Bark** of a year-old stem consists of three parts, more or less distinct, namely, — beginning next the wood, —

1. The Liber or Fibrous Bark, the *Inner Bark*. This contains some wood-cells, or their equivalent, commonly in the form of bast or bast-cells (411, Fig. 444), such as those of Basswood or Linden, and among herbs those of flax and hemp, which are spun and woven or made into cordage. It also contains cells which are named *sieve*-cells, on account of numerous slits and pores in their walls, by which the protoplasm of contiguous cells communicates. In woody stems, whenever a new layer of wood is formed, some new liber or inner bark is also formed outside of it.

Fig. 478. Piece of a stem of Soft Maple, of a year old, cut crosswise and lengthwise.

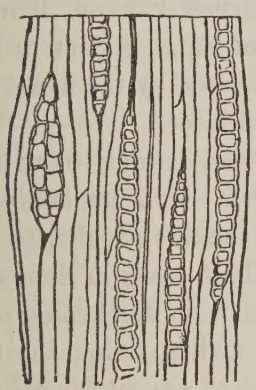
Fig. 479. A portion of the same, magnified.

Fig. 480. A small piece of the same, taken from one side, reaching from the bark to the pith, and highly magnified: *a*, a small bit of the pith; *b*, spiral ducts of what is called the *medullary sheath*; *c*, the wood; *d*, *d*, dotted ducts in the wood; *e*, *e*, annular ducts; *f*, the liber or inner bark; *g*, the green bark; *h*, the corky layer; *i*, the skin, or epidermis; *j*, one of the medullary rays, or plates of silver grain, seen on the cross-section.

2. The Green Bark or *Middle Bark.* This consists of cellular tissue only, and contains the same green matter (*chlorophyll*, 417) as the leaves. In woody stems, before the season's growth is completed, it becomes covered by

3. The Corky Layer or *Outer Bark*, the cells of which contain no chlorophyll, and are of the nature of *cork*. Common cork is the thick corky layer of the bark of the Cork-Oak of Spain. It is this which gives to the stems or twigs of shrubs and trees the aspect and the color peculiar to each, — light gray in the Ash, purple in the Red Maple, red in several Dogwoods, etc.

4. The Epidermis, or skin of the plant, consisting of a layer of thick-sided empty cells, which may be considered to be the outermost layer, or in most herbaceous stems the only layer, of cork-cells.



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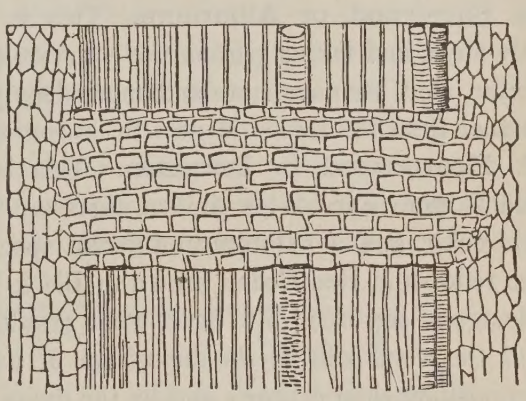

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432. The green layer of bark seldom grows much after the first season. Sometimes the corky layer grows and forms new layers, inside of the old, for years, as in the Cork-Oak, the Sweet Gum-tree, and the White and the Paper Birch. But it all dies after a while; and the continual enlargement of the wood within finally stretches it more than it can bear, and sooner or later cracks and rends it, while the weather acts powerfully upon its surface; so the older bark perishes and falls away piecemeal year by year.

433. So on old trunks only the inner bark remains. This is renewed every year from within and so kept alive, while the older and outer layers die, are fissured and rent by the distending trunk, weathered and worn, and thrown off in fragments, — in some trees slowly, so that the bark of old trunks may acquire great thickness; in others, more rapidly. In Honeysuckles and Grape-Vines, the layers of liber loosen and die when only a year or two old. The annual layers of liber are sometimes as distinct as those of the wood, but often not so.

Fig. 481. Magnified view of surface of a bit of young Maple wood from which the bark has been torn away, showing the wood-cells and the bark-ends of medullary rays.

Fig. 482. Section in the opposite direction, from bark (on the left) to beginning of pith (on the right), and a medullary ray extending from one to the other.

434. **The Wood** of an exogenous trunk, having the old growths covered by the new, remains nearly unchanged in age, except from decay. Wherever there is an annual suspension and renewal of growth, as in temperate climates, the annual growths are more or less distinctly marked, in the form of concentric rings on the cross section, so that the age of the tree may be known by counting them. Over twelve hundred layers have been counted on the stumps of Sequoias in California, and it is probable that some trees now living antedate the Christian era.

435. The reason why the annual growths are distinguishable is, that the wood formed at the beginning of the season is more or less different in the size or character of the cells from that of the close. In Oak, Chestnut, etc., the first wood of the season abounds in dotted ducts, the calibre of which is many times greater than that of the proper wood-cells.

436. **Sap-wood, or Alburnum.** This is the newer wood, living or recently alive, and taking part in the conveyance of sap. Sooner or later, each layer, as it becomes more and more deeply covered by the newer ones and farther from the region of growth, is converted into

437. **Heart-wood, or Duramen.** This is drier, harder, more solid, and much more durable as timber, than sap-wood. It is generally of a different color, and it exhibits in different species the hue peculiar to each, such as reddish in Red-Cedar, brown in Black-Walnut, black in Ebony, etc. The change of sap-wood into heart-wood results from the thickening of the walls of the wood-cells by the deposition of hard matter, lining the tubes and diminishing their calibre; and by the deposition of a vegetable coloring-matter peculiar to each species. The heart-wood, being no longer a living part, may decay, and often does so, without the least injury to the tree, except by diminishing the strength of the trunk, and so rendering it more liable to be overthrown.

438. **The Living Parts of a Tree,** of the exogenous kind, are only these: first, the rootlets at one extremity; second, the buds and leaves of the season at the other; and third, a zone consisting of the newest wood and the newest bark, connecting the rootlets with the buds or leaves, however widely separated these may be, — in the tallest trees from two to four hundred feet apart. And these parts of the tree are all renewed every year. No wonder, therefore, that trees may live so long, since they annually reproduce everything that is essential to their life and growth, and since only a very small part of their bulk is alive at once. The tree survives, but nothing now living has been so long. In it, as elsewhere, life is a transitory thing, ever abandoning the *old*, and renewed in the *young*.

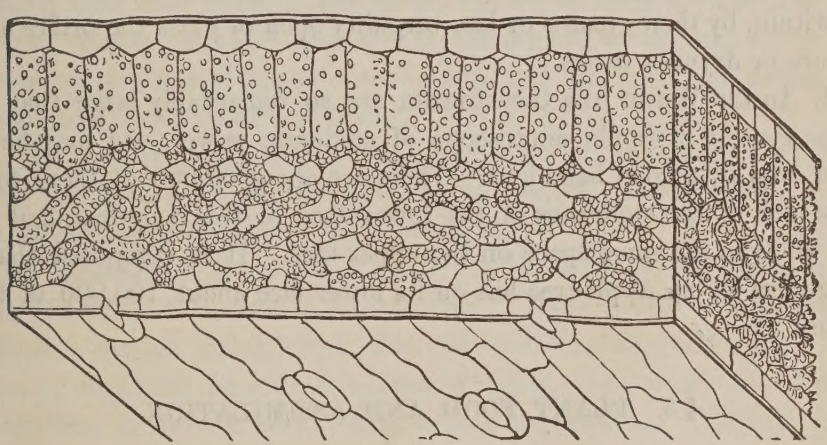
§ 4. ANATOMY OF LEAVES.

439. The wood in leaves is the framework of ribs, veins, and veinlets (125), serving not only to strengthen them, but also to bring in the sap, and to distribute it throughout every part. The cellular portion is the

green pulp, and is nearly the same as the green layer of the bark. So that the leaf may properly enough be regarded as a sort of expansion of the fibrous and green layers of the bark. It has no proper corky layer; but the whole is covered by a transparent skin or *epidermis*, resembling that of the stem.

440. The cells of the leaf are of various forms, rarely so compact as to form a close cellular tissue, usually loosely arranged, at least in the lower part, so as to give copious intervening spaces or air passages, communicating throughout the whole interior (Fig. 443, 483). The green color is given by the chlorophyll (417), seen through the very transparent walls of the cells and through the translucent epidermis of the leaf.

441. In ordinary leaves, having an upper and under surface, the green cells form two distinct strata, of different arrangement. Those of the upper stratum are oblong or cylindrical, and stand endwise to the surface of the leaf, usually close together, leaving hardly any vacant spaces; those of the lower are commonly irregular in shape, most of them with their longer diameter parallel to the face of the leaf, and are very loosely arranged, leaving many and wide air-chambers. The green color of the lower is therefore diluted, and paler than that of the upper face of the leaf. The upper part of the leaf is so constructed as to bear the direct action



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of the sunshine; the lower so as to afford freer circulation of air, and to facilitate transpiration. It communicates more directly than the upper with the external air by means of *Stomates*.

442. **The Epidermis** or skin of leaves and all young shoots is best seen in the foliage. It may readily be stripped off from the surface of a Lily-leaf, and still more so from more fleshy and soft leaves, such as those

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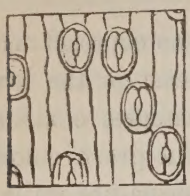
FIG. 483. Magnified section of a leaf of White Lily, to exhibit the cellular structure, both of upper and lower stratum, the air-passages of the lower, and the epidermis or skin, in section, also a little of that of the lower face, with some of its stomates.

of Houseleek. The epidermis is usually composed of a single layer, occasionally of two or three layers, of empty cells, mostly of irregular outline. The sinuous lines which traverse it, and may be discerned under low powers of the microscope (Fig. 487), are the boundaries of the epidermal cells.



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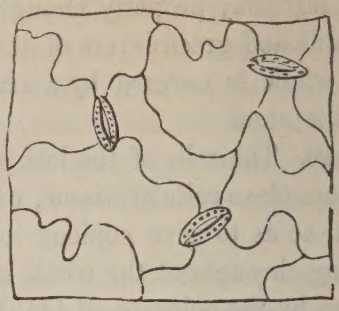

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443. **Breathing-pores, or Stomates, Stomata** (singular, a *Stoma*, — literally, a mouth) are openings through the epidermis into the air-chambers or intercellular passages, always between and guarded by a pair of thin-walled guardian cells. Although most abundant in leaves, especially on their lower face (that which is screened from direct sunlight), they are found on most other green parts. They establish a direct communication between the external air and that in the loose interior of the leaf. Their guardian cells or lips, which are soft and delicate, like those of the green pulp within, by their greater or less turgidity open or close the orifice as the moisture or dryness varies.

444. In the White Lily the stomata are so remarkably large that they may be seen by a simple microscope of moderate power, and may be discerned even by a good hand lens. There are about 60,000 of them to the square inch of the epidermis of the lower face of this Lily-leaf, and only about 3000 to the same space on the upper face. It is computed that an average leaf of an Apple-tree has on its lower face about 100,000 of these mouths.

§ 5. PLANT FOOD AND ASSIMILATION.

445. Only plants are capable of originating organizable matter, or the materials which compose the structure of vegetables and animals. The essential and peculiar work of plants is to take up portions of earth and air (water belonging to both) upon which animals cannot live at all, and to convert them into something organizable; that is, into something that, under life, may be built up into vegetable and animal structures. All the food of animals is produced by plants. Animals live upon vegetables,

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FIG. 484. Small portion of epidermis of the lower face of a White-Lily leaf, with stomata.

FIG. 485. One of these, more magnified, in the closed state. 486. Another stoma, open.

FIG. 487. Small portion of epidermis of the Garden Balsam, highly magnified, showing very sinuous-walled cells, and three stomata.

directly or at second hand, the carnivorous upon the herbivorous; and vegetables live upon earth and air, immediately or at second hand.

446. **The Food of plants**, then, primarily, is earth and air. This is evident enough from the way in which they live. Many plants will flourish in pure sand or powdered chalk, or on the bare face of a rock or wall, watered merely with rain. And almost any plant may be made to grow from the seed in moist sand, and increase its weight many times, even if it will not come to perfection. Many naturally live suspended from the branches of trees high in the air, and nourished by it alone, never having any connection with the soil; and some which naturally grow on the ground, like the Live-forever of the gardens, when pulled up by the roots and hung in the air will often flourish the whole summer long.

447. It is true that fast-growing plants, or those which produce much vegetable matter in one season (especially in such concentrated form as to be useful as food for man or the higher animals) will come to maturity only in an enriched soil. But what is a rich soil? One which contains decomposing vegetable matter, or some decomposing animal matter; that is, in either case, some decomposing organic matter formerly produced by plants. Aided by this, grain-bearing and other important vegetables will grow more rapidly and vigorously, and make a greater amount of nourishing matter, than they could if left to do the whole work at once from the beginning. So that in these cases also all the organic or organizable matter was made by plants, and made out of earth and air. Far the larger and most essential part was air and water.

448. Two kinds of material are taken in and used by plants; of which the first, although more or less essential to perfect plant-growth, are in a certain sense subsidiary, if not accidental, viz.: —

Earthy constituents, those which are left in the form of ashes when a leaf or a stick of wood is burned in the open air. These consist of some *potash* (or *soda* in a marine plant), some *silex* (the same as flint), and a little *lime*, *alumine*, or *magnesia*, *iron* or *manganese*, *sulphur*, *phosphorus*, etc., — some or all of these in variable and usually minute proportions. They are such materials as happen to be dissolved, in small quantity, in the water taken up by the roots; and when that is consumed by the plant, or flies off pure (as it largely does) by exhalation, the earthy matter is left behind in the cells, — just as it is left incrusting the sides of a teakettle in which much hard water has been boiled. Naturally, therefore, there is more earthy matter (i. e. more ashes) in the leaves than in any other part (sometimes as much as seven per cent, when the wood contains only two per cent); because it is through the leaves that most of the water escapes from the plant. Some of this earthy matter incrusts the cell-walls, some goes to form crystals or rhaphides, which abound in many plants (422), some enters into certain special vegetable products, and some appears to be necessary to the well-being of the higher orders of plants, although forming no necessary part of the proper vegetable structure.

The essential constituents of the organic fabric are those which are dissipated into air and vapor in complete burning. They make up from 88 to 99 per cent of the leaf or stem, and essentially the whole both of the cellulose of the walls and the protoplasm of the contents. Burning gives these materials of the plant's structure back to the air, mainly in the same condition in which the plant took them, the same condition which is reached more slowly in natural decay. The chemical elements of the cell-walls (or cellulose, 402), as also of starch, sugar, and all that class of organizable cell-material, are carbon, hydrogen, and oxygen (399). The same, with nitrogen, are the constituents of protoplasm, or the truly vital part of vegetation.

449. These chemical elements out of which organic matters are composed are supplied to the plant by water, carbonic acid, and some combinations of nitrogen.

Water, far more largely than anything else, is imbibed by the roots; also more or less by the foliage in the form of vapor. Water consists of oxygen and hydrogen; and cellulose or plant-wall, starch, sugar, etc., however different in their qualities, agree in containing these two elements in the same relative proportions as in water.

Carbonic acid gas (Carbon dioxide) is one of the components of the atmosphere, — a small one, ordinarily only about $\frac{1}{2500}$ of its bulk, — sufficient for the supply of vegetation, but not enough to be injurious to animals, as it would be if accumulated. Every current or breeze of air brings to the leaves expanded in it a succession of fresh atoms of carbonic acid, which it absorbs through its multitudinous breathing-pores. This gas is also taken up by water. So it is brought to the ground by rain, and is absorbed by the roots of plants, either as dissolved in the water they imbibe, or in the form of gas in the interstices of the soil. Manured ground, that is, soil containing decomposing vegetable or animal matters, is constantly giving out this gas into the interstices of the soil, whence the roots of the growing crop absorb it. Carbonic acid thus supplied, primarily from the air, is the source of the carbon which forms much the largest part of the substance of every plant. The proportion of carbon may be roughly estimated by charring some wood or foliage; that is, by heating it out of contact with the air, so as to decompose and drive off all the other constituents of the fabric, leaving the large bulk of charcoal or carbon behind.

Nitrogen, the remaining plant-element, is a gas which makes up more than two thirds of the atmosphere, is brought into the foliage and also to the roots (being moderately soluble in water) in the same ways as is carbonic acid. The nitrogen which, mixed with oxygen, a little carbonic acid, and vapor of water, constitutes the air we breathe, is the source of this fourth plant-element. But it is very doubtful if ordinary plants can use any nitrogen gas directly as food; that is, if they can directly cause it to combine with the other elements so as to form protoplasm. But when combined with hydrogen (forming ammonia), or when combined with oxygen

(nitric acid and nitrates) plants appropriate it with avidity. And several natural processes are going on in which nitrogen of the air is so combined and supplied to the soil in forms directly available to the plant. The most efficient is *nitrification*, the formation of nitre (nitrate of potash) in the soil, especially in all fertile soils, through the action of a bacterial ferment.

450. **Assimilation** in plants is the conversion of these inorganic substances — essentially, water, carbonic acid, and some form of combined or combinable nitrogen — into vegetable matter. This most dilute food the living plant concentrates and assimilates to itself. Only plants are capable of converting these mineral into organizable matters; and this all-important work is done by them (so far as all ordinary vegetation is concerned) only

451. *Under the light of the sun, acting upon green parts or foliage*, that is, upon the chlorophyll, or upon what answers to chlorophyll, which these parts contain. The sun in some way supplies a power which enables the living plant to originate these peculiar chemical combinations, — to organize matter into forms which are alone capable of being endowed with life. The proof of this proposition is simple; and it shows at the same time, in the simplest way, what a plant does with the water and carbonic acid it consumes. Namely, 1st, it is only in sunshine or bright daylight that the green parts of plants give out oxygen gas, — then they regularly do so; and 2d, the giving out of this oxygen gas is required to render the chemical composition of water and carbonic acid the same as that of *cellulose*, that is, of the plant's permanent fabric. This shows why plants spread out so large a surface of foliage. Leaves are so many workshops, full of machinery worked by sun-power. The emission of oxygen gas from any sun-lit foliage is seen by placing some of this under water, or by using an aquatic plant, by collecting the air bubbles which rise, and by noting that a taper burns brighter in this air. Or a leafy plant in a glass globe may be supplied with a certain small percentage of carbonic acid gas, and after proper exposure to sunshine, the air on being tested will be found to contain less carbonic acid and just so much the more oxygen gas.

452. Now if the plant is making cellulose or any equivalent substance, — that is, is making the very materials of its fabric and growth, as must generally be the case, — all this oxygen gas given off by the leaves comes from the decomposition of carbonic acid taken in by the plant. For cellulose, and also starch, dextrine, sugar, and the like are composed of carbon along with oxygen and hydrogen in just the proportions to form water. And the carbonic acid and water taken in, less the oxygen which the carbon brought with it as carbonic acid, and which is given off from the foliage in sunshine, just represents the manufactured article, cellulose.

453. It comes to the same if the first product of assimilation is sugar, or dextrine which is a sort of soluble starch, or starch itself. And in the plant all these forms are readily changed into one another. In the tiny seedling, as fast as this assimilated matter is formed it is used in growth, that is, in the formation of cell-walls. After a time some or much of

the product may be accumulated in store for future growth, as in the root of the turnip, or the tuber of the potato, or the seed of corn or pulse. This store is mainly in the form of starch. When growth begins anew, this starch is turned into dextrine or into sugar, in liquid form, and used to nourish and build up the germinating embryo or the new shoot, where it is at length converted into cellulose and used to build up plant-structure.

454. But that which builds plant-fabric is not the cellular structure itself; the work is done by the living protoplasm which dwells within the walls. This also has to take and to assimilate its proper food, for its own maintenance and growth. Protoplasm assimilates, along with the other three elements, the nitrogen of the plant's food. This comes primarily from the vast stock in the atmosphere, but mainly through the earth, where it is accumulated through various processes in a fertile soil, — mainly, so far as concerns crops, from the decomposition of former vegetables and animals. This protoplasm, which is formed at the same time as the simpler cellulose, is essentially the same as the flesh of animals, and the source of it. It is the common basis of vegetable and of animal life.

455. *So plant-assimilation produces all the food and fabric of animals.* Starch, sugar, the oils (which are, as it were, these farinaceous matters more deoxidated), chlorophyll, and the like, and even cellulose itself, form the food of herbivorous animals and much of the food of man. When digested they enter into the blood, undergo various transformations, and are at length decomposed into carbonic acid and water, and exhaled from the lungs in respiration, — in other words, are given back to the air by the animal as the very same materials which the plant took from the air as its food, — are given back to the air in the same form that they would have taken if the vegetable matter had been left to decay where it grew, or if it had been set on fire and burned; and with the same result, too, as to the heat, — the heat in this case producing and maintaining the proper temperature of the animal.

456. The protoplasm and other products containing nitrogen (gluten, legumine, etc.), and which are most accumulated in grains and seeds (for the nourishment of their embryos when they germinate), compose the most nutritious vegetable food consumed by animals; they form their proper flesh and sinews, while the earthy constituents of the plant form the earthy matter of the bones, etc. At length decomposed, in the secretions and excretions, these nitrogenous constituents are through successive changes finally resolved into mineral matter, into carbonic acid, water, and ammonia or some nitrates, — into exactly or essentially the same materials which the plants took up and assimilated. Animals depend upon vegetables absolutely and directly for their subsistence; also indirectly, because

457. *Plants purify the air for animals.* In the very process by which they create food they take from the air carbonic acid gas, injurious to animal respiration, which is continually poured into it by the breathing of all animals, by all decay, by the burning of fuel and all other ordinary combustion; and

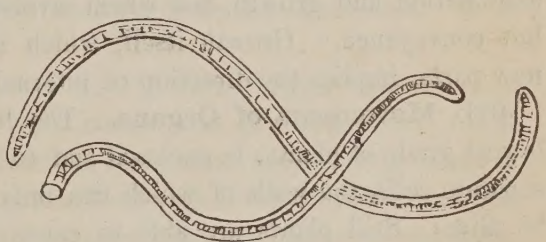
they restore an equal bulk of life-sustaining oxygen needful for the respiration of animals, — needful, also, in a certain measure, for plants in any work they do. For in plants, as well as in animals, work is done at a certain cost.

§ 6. PLANT WORK AND MOVEMENT.

458. As the organic basis and truly living material of plants is identical with that of animals, so is the life at bottom essentially the same; but in animals something is added at every rise from the lowest to highest organisms. Action and work in living beings require movement.

459. Living things move; those not living are only moved. Plants move as truly as do animals. The latter, nourished as they are upon organized food, which has been prepared for them by plants, and is found only here and there, must needs have the power of going after it, of collecting it, or at least of taking it in; which requires them to make spontaneous movements. But ordinary plants, with their wide-spread surface, always in contact with the earth and air on which they feed, — the latter everywhere the same, and the former very much so, — might be thought to have no need of movement. Ordinary plants, indeed, have no locomotion; some float, but most are rooted to the spot where they grew. Yet probably all of them execute various movements which must be as truly self-caused as are those of the lower grades of animals, — movements which are overlooked only because too slow to be directly observed. Nevertheless, the motion of the hour-hand and of the minute-hand of a watch is not less real than that of the second-hand.

460. **Locomotion.** Moreover, many microscopic plants living in water are seen to move freely, if not briskly, under the microscope; and so likewise do more conspicuous aquatic plants in their embryo-like or seedling state. Even at maturity, species of Oscillaria (such as in Fig. 488, minute worm-shaped plants of fresh waters, taking this name from their oscillating motions) freely execute three different kinds of movement, the very delicate investing coat of cellulose not impeding the action of the living protoplasm within. Even when this coat is firmer and hardened with a siliceous deposit, such crescent-shaped or boat-shaped one-celled plants as *Closterium* or *Navicula* are able in some way to move along from place to place in the water.



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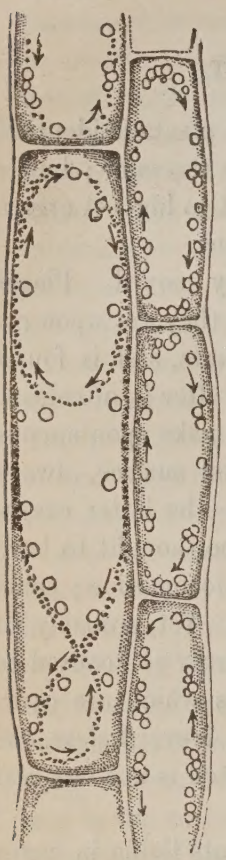
461. **Movements in Cells, or Cell-circulation,** sometimes called *Cyclosis*, has been detected in so many plants, especially in comparatively

FIG. 488. Two individuals of an Oscillaria, magnified.

transparent aquatic plants and in hairs on the surface of land plants (where it is easiest to observe), that it may be inferred to take place in all cells during the most active part of their life. This motion is commonly a streaming movement of threads of protoplasm, carrying along solid granules by which the action may be observed and the rate measured, or in some cases it is a rotation of the whole protoplasmic contents of the cell. A comparatively low magnifying power will show it in the cells of Nitella and Chara (which are cryptogamous plants); and under a moderate power it is well seen in the Tape Grass of fresh water, Vallisneria, and in Naias flexilis (Fig. 489). Minute particles and larger greenish globules are seen to be carried along, as if in a current, around the cell, passing up one side, across the end, down the other and across the bottom, completing the circuit sometimes within a minute or less when well warmed. To see it well in the cell, which like a string of beads form the hairs on the stamens of Spiderwort, a high magnifying power is needed.



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462. **Transference of Liquid from Cell to Cell,** and so from place to place in the plant, the absorption of water by the rootlets, and the exhalation of the greater part of it from the foliage, — these and similar operations are governed by the physical laws which regulate the diffusion of fluids, but are controlled by the action of living protoplasm. Equally under vital control are the various chemical transformations which attend assimilation and growth, and which involve not only molecular movements but conveyance. Growth itself, which is the formation and shaping of new parts, implies the direction of internal activities to definite ends.

463. **Movements of Organs.** The living protoplasm, in all but the lowest grade of plants, is enclosed and to common appearance isolated in separate cells, the walls of which can only in their earliest state be said to be alive. Still plants are able to cause the protoplasm of adjacent cells to act in concert, and by their combined action to effect movements in roots, stems, or leaves, some of them very slow and gradual, some manifest and striking. Such movements are brought about through individually minute changes in the form or tension in the protoplasm of the innumerable cells which make up the structure of the organ. Some of the slower movements are effected during growth, and may be explained by inequality of growth on the two sides of the bending organ. But the more rapid changes of position, and some of the slow ones, cannot be so explained.

FIG. 489. A few cells of a leaf of Naias flexilis, highly magnified: the arrows indicate the courses of the circulating currents.

464. **Root-movements.** In its growth a root turns or bends away from the light and toward the centre of the earth, so that in lengthening it buries itself in the soil where it is to live and act. Every one must have observed this in the germination of seeds. Careful observations have shown that the tip of a growing root also makes little sweeps or short movements from side to side. By this means it more readily insinuates itself into yielding portions of the soil. The root-tips will also turn toward moisture, and so secure the most favorable positions in the soil.

465. **Stem-movements.** The root end of the caulicle or first joint of stem (that below the cotyledons) acts like the root, in turning downward in germination (making a complete bend to do so if it happens to point upward as the seed lies in the ground), while the other end turns or points skyward. These opposite positions are taken in complete darkness as readily as in the light, in dryness as much as in moisture: therefore, so far as these movements are physical, the two portions of the same internode appear to be oppositely affected by gravitation or other influences.

466. Rising into the air, the stem and green shoots generally, while young and pliable, bend or direct themselves toward the light, or toward the stronger light when unequally illuminated; while roots turn toward the darkness.

467. Many growing stems have also a movement of *Nutation*, that is, of nodding successively in different directions. This is brought about by a temporary increase of turgidity of the cells along one side, thus bowing the stem over to the opposite side; and this line of turgescence travels round the shoot continually, from right to left or from left to right according to the species: thus the shoot bends to all points of the compass in succession. Commonly this nutation is slight or hardly observable. It is most marked in

468. **Twining Stems** (Fig. 90). The growing upper end of such stems, as is familiar in the Hop, Pole Beans, and Morning-Glory, turns over in an inclined or horizontal direction, thus stretching out to reach a neighboring support, and by the continual change in the direction of the nodding, sweeps the whole circle, the sweeps being the longer as the stem lengthens. When it strikes against a support, such as a stem or branch of a neighboring plant, the motion is arrested at the contact, but continues at the growing apex beyond, and this apex is thus made to wind spirally around the supporting body.

469. **Leaf-movements** are all but universal. The presentation by most leaves of their upper surface to the light, from whatever direction that may come, is an instance; for when turned upside down they twist or bend round on the stalk to recover this normal position. Leaves, and the leaflets of compound leaves, change this position at nightfall, or when the light is withdrawn; they then take what is called their sleeping posture, resuming the diurnal position when daylight returns. This is very striking

in Locust-trees, in the Sensitive Plant (Fig. 490), and in Woodsorrel. Young seedlings droop or close their leaves at night in plants which are not thus affected in the adult foliage. All this is thought to be a protection against the cold by nocturnal radiation.

470. Various plants climb by a coiling movement of their leaves or their leaf-stalks. Familiar examples are seen in Clematis, Maurandia, Tropæolum, and in a Solanum which is much cultivated in greenhouses (Fig. 172). In the latter, and in other woody plants which climb in this way, the petioles thicken and harden after they have grasped their support, thus securing a very firm hold.

471. **Tendril movements.** Tendrils are either leaves or stems (98, 168), specially developed for climbing purposes. Cobæa is a good example of partial transformation; some of the leaflets are normal, some of the same leaf are little tendrils, and some intermediate in character. The Passion-flowers give good examples of simple stem-tendrils (Fig. 92); Grape-Vines, of branched ones. Most tendrils make revolving sweeps, like those of twining stems. Those of some Passion-flowers, in sultry weather, are apt to move fast enough for the movement actually to be seen for a part of the circuit, as plainly as that of the second-hand of a watch. Two herbaceous species, Passiflora gracilis and P. sicyoides (the first an annual, the second a strong-rooted perennial of the easiest cultivation), are admirable for illustration both of revolving movements and of sensitive coiling.

472. **Movements under Irritation.** The most familiar case is that of the Sensitive Plant (Fig. 490). The leaves suddenly take their nocturnal position when roughly touched or when shocked by a jar. The leaflets close in pairs, the four outspread partial petioles come closer together, and the common petiole is depressed. The seat of the movements is at the base of the leaf-stalk and stalklets. Schrankia, a near relative of the Sensitive Plant, acts in the same way, but is slower. These are not anomalous actions, but only extreme manifestations of a faculty more or less common in foliage. In Locust and Honey-Locusts for example, repeated jars will slowly produce similar effects.

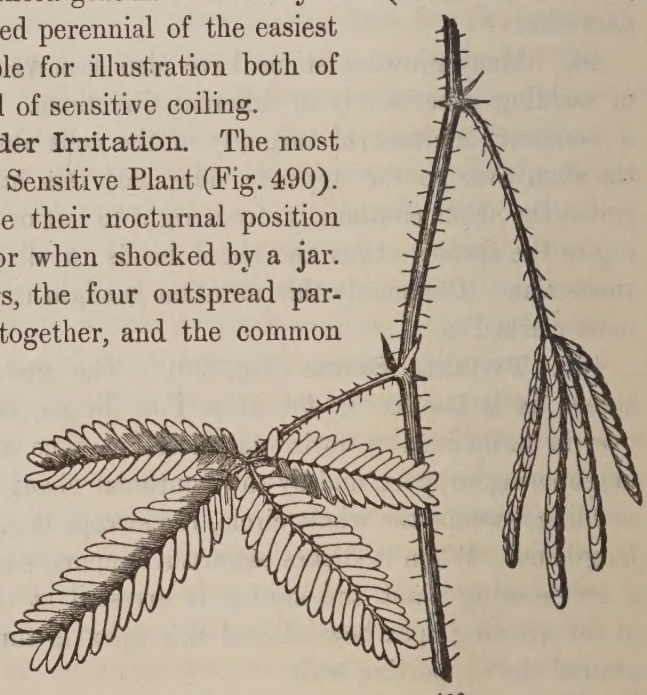

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FIG. 490. Piece of stem of Sensitive Plant (Mimosa pudica), with two leaves, the lower open, the upper in the closed state.

473. Leaf-stalks and tendrils are adapted to their uses in climbing by a similar sensitiveness. The coiling of the leaf-stalk is in response to a kind of irritation produced by contact with the supporting body. This may be shown by gentle rubbing or prolonged pressure upon the upper face of the leaf-stalk, which is soon followed by a curvature. Tendrils are still more sensitive to contact or light friction. This causes the free end of the tendril to coil round the support, and the sensitiveness, propagated downward along the tendril, causes that side of it to become less turgescent or the opposite side more so, thus throwing the tendril into coils. This shortening draws the plant up to the support. Tendrils which have not laid hold will at length commonly coil spontaneously, in a simple coil, from the free apex downward. In Sicyos, Echinocystis, and the above mentioned Passion-flowers (471), the tendril is so sensitive, under a high summer temperature, that it will curve and coil promptly after one or two light strokes by the hand.

474. Among spontaneous movements the most singular are those of Desmodium gyrans of India, sometimes called Telegraph-plant, which is cultivated on account of this action. Of its three leaflets, the larger (terminal) one moves only by drooping at nightfall and rising with the dawn. But its two small lateral leaflets, when in a congenial high temperature, by day and by night move upward and downward in a succession of jerks, stopping occasionally, as if to recover from exhaustion. In most plant-movements some obviously useful purpose is subserved: this of Desmodium gyrans is a riddle.

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475. **Movements in Flowers** are very various. The most remarkable are in some way connected with fertilization (Sect. XIII.). Some occur under irritation: the stamens of Barberry start forward when touched at the base inside: those of many polyandrous flowers (of Sparmannia very strikingly) spread outwardly when lightly brushed: the two lips or lobes

FIG. 491. Portion of stem and leaves of Telegraph-plant (Desmodium gyrans), almost of natural size.

of the stigma in Mimulus close after a touch. Some are automatic and are connected with dichogamy (339): the style of Sabbatia and of large-flowered species of Epilobium bends over strongly to one side or turns downward when the blossom opens, but slowly erects itself a day or two later.

476. **Extraordinary Movements connected with Capture of Insects.** The most striking cases are those of Drosera and Dionæa; for an account of which see "How Plants Behave," and Goodale's "Physiological Botany."

477. The upper face of the leaves of the common species of Drosera, or Sundew, is beset with stout bristles, having a glandular tip. This tip secretes a drop of a clear but very viscid liquid, which glistens like a dew-drop in the sun; whence the popular name. When a fly or other small insect, attracted by the liquid, alights upon the leaf, the viscid drops are so tenacious that they hold it fast. In struggling it only becomes more completely entangled. Now the neighboring bristles, which have not been touched, slowly bend inward from all sides toward the captured insect, and bring their sticky apex against its body, thus increasing the number of bonds. Moreover, the blade of the leaf commonly aids in the capture by becoming concave, its sides or edges turning inward, which brings still more of the gland-tipped bristles into contact with the captive's body. The insect perishes; the clear liquid disappears, apparently by absorption into the tissue of the leaf. It is thought that the absorbed secretion takes with it some of the juices of the insect or the products of its decomposition.

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478. Dionæa muscipula, the most remarkable vegetable fly-trap (Fig. 176, 492), is related to the Sundews, and has a more special and active apparatus for fly-catching, formed of the summit of the leaf. The two halves of this rounded body move as if they were hinged upon the midrib; their edges are fringed with spiny but not glandular bristles, which interlock when the organ closes. Upon the face are two or three short and delicate bristles, which are sensitive. They do not themselves move when touched, but they propagate the sensitiveness to the organ itself, causing it to close with a quick movement. In a fresh

FIG. 492. Plant of Dionæa muscipula, or Venus's Fly-trap, reduced in size.

and vigorous leaf, under a high summer temperature, and when the trap lies widely open, a touch of any one of the minute bristles on the face, by the finger or any extraneous body, springs the trap (so to say), and it closes suddenly; but after an hour or so it opens again. When a fly or other small insect alights on the trap, it closes in the same manner, and so quickly that the intercrossing marginal bristles obstruct the egress of the insect, unless it be a small one and not worth taking. Afterwards and more slowly it completely closes, and presses down upon the prey; then some hidden glands pour out a glairy liquid, which dissolves out the juices of the insect's body; next all is re-absorbed into the plant, and the trap opens to repeat the operation. But the same leaf perhaps never captures more than two or three insects. It ages instead, becomes more rigid and motionless, or decays away.

479. That some few plants should thus take animal food will appear less surprising when it is considered that hosts of plants of the lower grade, known as Fungi, moulds, rusts, ferments, Bacteria, etc., live upon animal or other organized matter, either decaying or living. That plants should execute movements in order to accomplish the ends of their existence is less surprising now when it is known that the living substance of plants and animals is essentially the same; that the beings of both kingdoms partake of a common life, to which, as they rise in the scale, other and higher endowments are successively superadded.

480. **Work uses up material and energy** in plants as well as in animals. The latter live and work by the consumption and decomposition of that which plants have assimilated into organizable matter through an energy derived from the sun, and which is, so to say, stored up in the assimilated products. In every internal action, as well as in every movement and exertion, some portion of this assimilated matter is transformed and of its stored energy expended. The steam-engine is an organism for converting the sun's radiant energy, stored up by plants in the fuel, into mechanical work. An animal is an engine fed by vegetable fuel in the same or other forms, from the same source, by the decomposition of which it also does mechanical work. The plant is the producer of food and accumulator of solar energy or force. But the plant, like the animal, is a consumer whenever and by so much as it does any work except its great work of assimilation. Every internal change and movement, every transformation, such as that of starch into sugar and of sugar into cell-walls, as well as every movement of parts which becomes externally visible, is done at the expense of a certain amount of its assimilated matter and of its stored energy; that is, by the decomposition or combustion of sugar or some such product into carbonic acid and water, which is given back to the air, just as in the animal it is given back to the air in respiration. So the respiration of plants is as real and as essential as that of animals. But what plants consume or decompose in their life and action is of insignificant amount in comparison with what they compose.

SECTION XVII. CRYPTOGAMOUS OR FLOWERLESS PLANTS.

481. Even the beginner in botany should have some general idea of what cryptogamous plants are, and what are the obvious distinctions of the principal families. Although the lower grades are difficult, and need special books and good microscopes for their study, the higher orders, such as Ferns, may be determined almost as readily as phanerogamous plants.

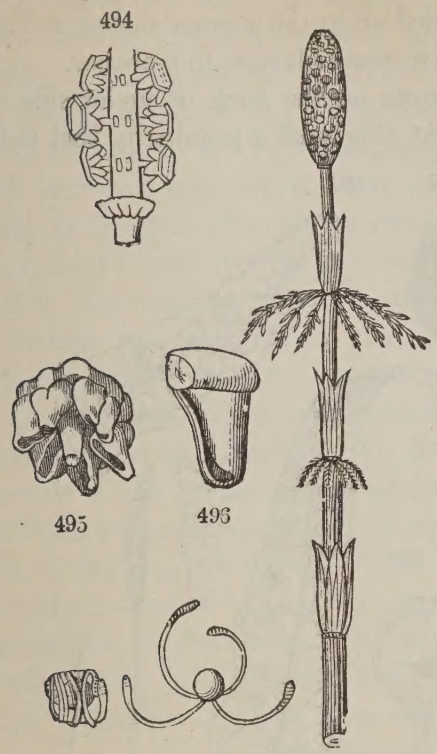
482. Linnæus gave to this lower grade of plants the name of *Cryptogamia*, thereby indicating that their organs answering to stamens and pistils, if they had any, were recondite and unknown. There is no valid reason why this long-familiar name should not be kept up, along with the counterpart one of *Phanerogamia* (6), although organs analogous to stamens and pistil, or rather to pollen and ovule, have been discovered in all the higher and most of the lower grades of this series of plants. So also the English synonymous name of *Flowerless Plants* is both good and convenient: for they have not flowers in the proper sense. The essentials of flowers are stamens and pistils, giving rise to seeds, and the essential of a seed is an embryo (8). Cryptogamous or Flowerless plants are propagated by SPORES; and a spore is not an embryo-plantlet, but mostly a single plant-cell (399).

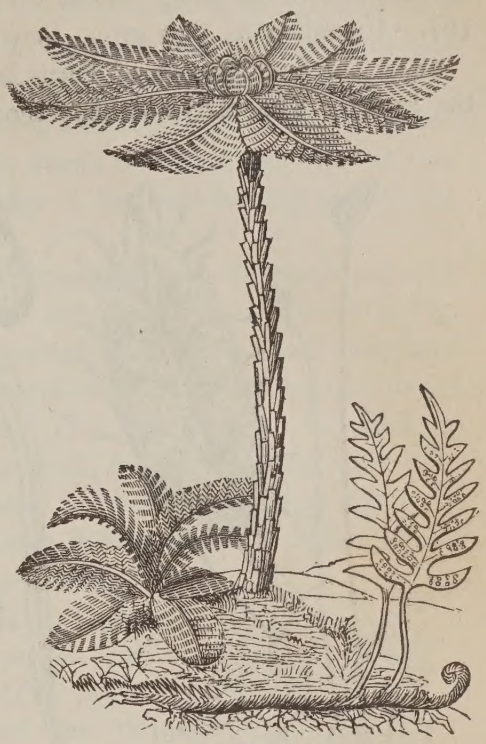
483. **Vascular Cryptogams**, which compose the higher orders of this series of plants, have stems and (usually) leaves, constructed upon the general plan of ordinary plants; that is, they have wood (wood-cells and vessels, 408) in the stem and leaves, in the latter as a frame work of veins. But the lower grades, having only the more elementary cellular structure, are called *Cellular Cryptogams*. Far the larger number of the former are Ferns: wherefore that class has been called

484. **Pteridophyta, Pteridophytes** in English form, meaning *Fern-plants*, — that is, Ferns and their relatives. They are mainly Horsetails, Ferns, Club-Mosses, and various aquatics which have been called *Hydropterides*, i. e. Water-Ferns.

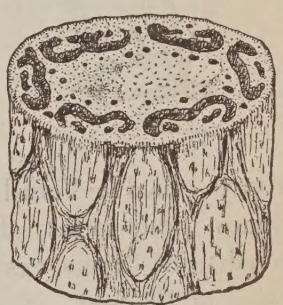
485. **Horsetails**, *Equisetaceæ*, is the name of a family which consists only (among now-living plants) of *Equisetum*, the botanical name of Horsetail and Scouring Rush. They have hollow stems, with partitions at the nodes; the leaves consist only of a whorl of scales at each node, these coalescent into a sheath: from the axils of these leaf-scales, in many species, branches grow out, which are similar to the stem but on a much smaller scale, close-jointed, and with the tips of the leaves more apparent. At the apex of the stem appears the *fructification*, as it is called for lack of a better term, in the form of a short spike or head. This consists of a good number of stalked shields, bearing on their inner or under face several wedge-shaped spore-cases. The spore-cases when they ripen open down the inner

side and discharge a great number of green spores of a size large enough to be well seen by a hand-glass. The spores are aided in their discharge





and dissemination by four club-shaped threads attached to one part of them. These are hygrometric: when moist they are rolled up over the spore; when dry they straighten, and exhibit lively movements, closing over the spore when breathed upon, and unrolling promptly a moment after as they dry. (See Fig. 493–498.)



486. **Ferns, or Filices**, a most attractive family of plants, are very numerous and varied. In warm and equable climates some rise into forest-trees, with habit of Palms; but most of them are perennial herbs. The wood of a Fern-trunk is very different, however, from that of a palm, or of any exogenous stem either. A section is represented in Fig. 500. The curved plates of wood each ter-

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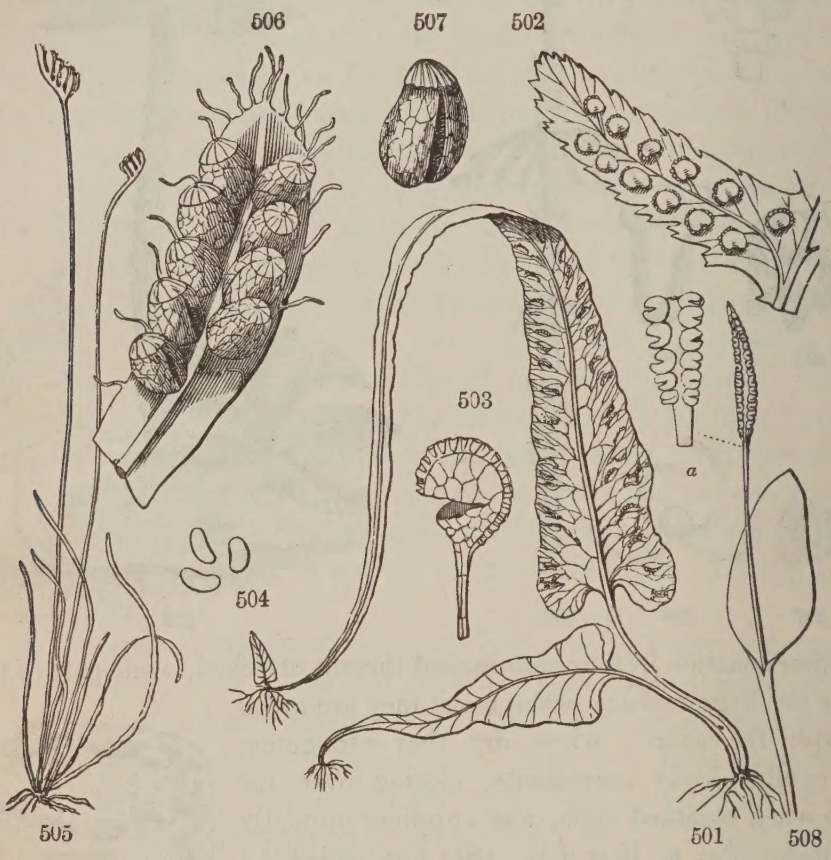
Fig. 493. Upper part of a stem of a Horsetail, Equisetum sylvaticum. 494. Part of the head or spike of spore-cases, with some of the latter taken off. 495. View (more enlarged) of under side of the shield-shaped body, bearing a circle of spore-cases. 496. One of the latter detached and more magnified. 497. A spore with the attached arms moistened. 498. Same when dry, the arms extended.

Fig. 499. A Tree-Fern, Dicksonia arborescens, with a young one near its base. In front a common herbaceous Fern (Polypodium vulgare) with its creeping stem or rootstock.

Fig. 500. A section of the trunk of a Tree-Fern.

minate upward in a leaf-stalk. The subterranean trunk or stem of any strong-growing herbaceous Fern shows a similar structure. Most Ferns are circinate in the bud; that is, are rolled up in the manner shown in Fig. 197. Uncoiling as they grow, they have some likeness to a crosier.

487. The fructification of Ferns is borne on the back or under side of the leaves. The early botanists thought this such a peculiarity that they



always called a Fern-leaf a FROND, and its petiole a STIPE. Usage continues these terms, although they are superfluous. The fruit of Ferns consists of SPORE-CASES, technically SPORANGIA, which grow out of the veins of the leaf. Sometimes these are distributed over the whole lower

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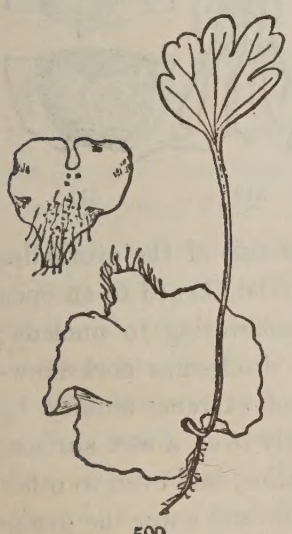
FIG. 501. The Walking-Fern, Camptosorus, reduced in size, showing its fruit-dots on the veins approximated in pairs. 502. A small piece (pinnule) of a Shield-Fern: a row of fruit-dots on each side of the midrib, each covered by its kidney-shaped indusium. 503. A spore-case from the latter, just bursting by the partial straightening of the incomplete ring; well magnified. 504. Three of the spores of 509, more magnified. 505. Schizæa pusilla, a very small and simple-leaved Fern, drawn nearly of natural size. 506. One of the lobes of its fruit-bearing portion, magnified, bearing two rows of spore-cases. 507. Spore-case of the latter, detached, opening lengthwise. 508. Adder-tongue, Ophioglossum: spore-cases in a kind of spike: *a*, a portion of the fruiting part, about natural size; showing two rows of the firm spore-cases, which open transversely into two valves.

surface of the leaf or frond, or over the whole surface when there are no proper leaf-blades to the frond, but all is reduced to stalks. Commonly the spore-cases occupy only detached spots or lines, each of which is called a SORUS, or in English merely a Fruit-dot. In many Ferns these fruit-dots are naked; in others they are produced under a scale-like bit of membrane, called an INDUSIUM. In Maidenhair-Ferns a little lobe of the leaf is folded back over each fruit-dot, to serve as its shield or indusium. In the true Brake or Bracken (Pteris) the whole edge of the fruit-bearing part of the leaf is folded back over it like a hem.

488. The form and structure of the spore-cases can be made out with a common hand magnifying glass. The commonest kind (shown in Fig. 503) has a stalk formed of a row of jointed cells, and is itself composed of a layer of thin-walled cells, but is incompletely surrounded by a border of thicker-walled cells, forming the RING. This extends from the stalk up one side of the spore-case, round its summit, descends on the other side, but there gradually vanishes. In ripening and drying the shrinking of the cells of the ring on the outer side causes it to straighten; in doing so it tears the spore-case open on the weaker side and discharges the minute spores that fill it, commonly with a jerk which scatters them to the wind. Another kind of spore-case (Fig. 507) is stalkless, and has its ring-cells forming a kind of cap at the top: at maturity it splits from top to bottom by a regular dehiscence. A third kind is of firm texture and opens across into two valves, like a clam-shell (Fig. 508[a]): this kind makes an approach to the next family.



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489. The spores germinate on moistened ground. In a conservatory they may be found germinating on a damp wall or on the edges of a well-watered flower-pot. Instead of directly forming a fern-plantlet, the spore grows first into a body which

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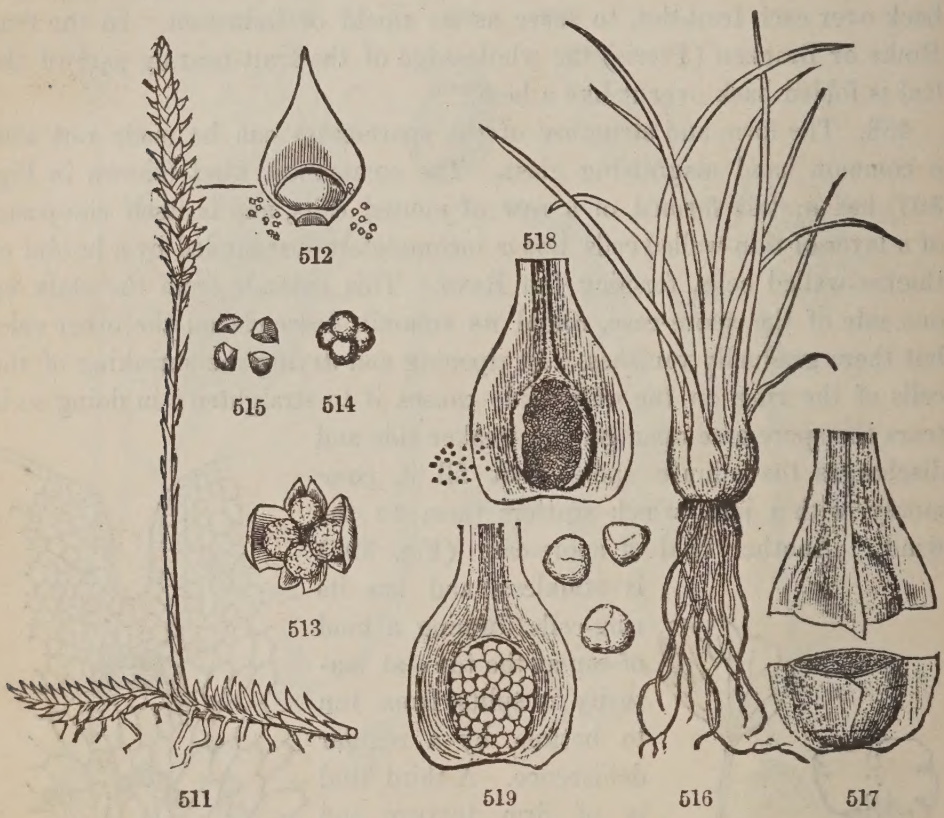
FIG. 509. A young prothallus of a Maiden-hair, moderately enlarged, and an older one with the first fern-leaf developed from near the notch. 510. Middle portion of the young one, much magnified, showing below, partly among the rootlets, the *antheridia* or fertilizing organs, and above, near the notch, three *pistillidia* to be fertilized.

closely resembles a small Liverwort. This is named a PROTHALLUS (Fig. 509): from some point of this a bud appears to originate, which produces the first fern-leaf, soon followed by a second and third, and so the stem and leaves of the plant are set up.

490. Investigation of this prothallus under the microscope resulted in the discovary of a wholly unsuspected kind of fertilization, taking place at



this germinating stage of the plant. On the under side of the prothallus two kinds of organs appear (Fig. 510). One may be likened to an open and depressed ovule, with a single cell at bottom answering to nucleus; the other, to an anther; but instead of pollen, it discharges corkscrew-shaped microscopic filaments, which bear some cilia of extreme tenuity, by the rapid vibration of which the filaments move freely over a wet surface. These filaments travel over the surface of the prothallus, and even to other prothalli (for there are natural hybrid Ferns), reach and enter the ovule-

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FIG. 511. Lycopodium Carolinianum, of nearly natural size. 512. Inside view of one of the bracts and spore-case, magnified.

FIG. 513. Open 4-valved spore-case of a Selaginella, and its four large spores (macrospores), magnified. 514. Macrospores of another Selaginella. 515. Same separated.

FIG. 516. Plant of Isoetes. 517. Base of a leaf and contained sporocarp filled with microspores cut across, magnified. 518. Same divided lengthwise, equally magnified; some microspores seen at the left. 519. Section of a spore-case containing macrospores, equally magnified; at the right three macrospores more magnified.

like cavities, and fertilize the cell. This thereupon sets up a growth, forms a vegetable bud, and so develops the new plant.

491. An essentially similar process of fertilization has been discovered in the preceding and the following families of Pteridophytes; but it is mostly subterranean and very difficult to observe.

492. **Club-Mosses or Lycopodiums.** Some of the common kinds, called Ground Pine, are familiar, being largely used for Christmas wreaths and other decoration. They are low evergreens, some creeping, all with considerable wood in their stems: this thickly beset with small leaves. In the axils of some of these leaves, or more commonly, in the axils of peculiar leaves changed into bracts (as in Fig. 511, 512) spore-cases appear, as roundish or kidney-shaped bodies, of firm texture, opening round the top into two valves, and discharging a great quantity of a very fine yellow powder, the spores.

493. The Selaginellas have been separated from Lycopodium, which they much resemble, because they produce two kinds of spores, in separate spore-cases. One kind (MICROSPORES) is just that of Lycopodium; the other consists of only four large spores (MACROSPORES), in a spore-case which usually breaks in pieces at maturity (Fig. 513–515).

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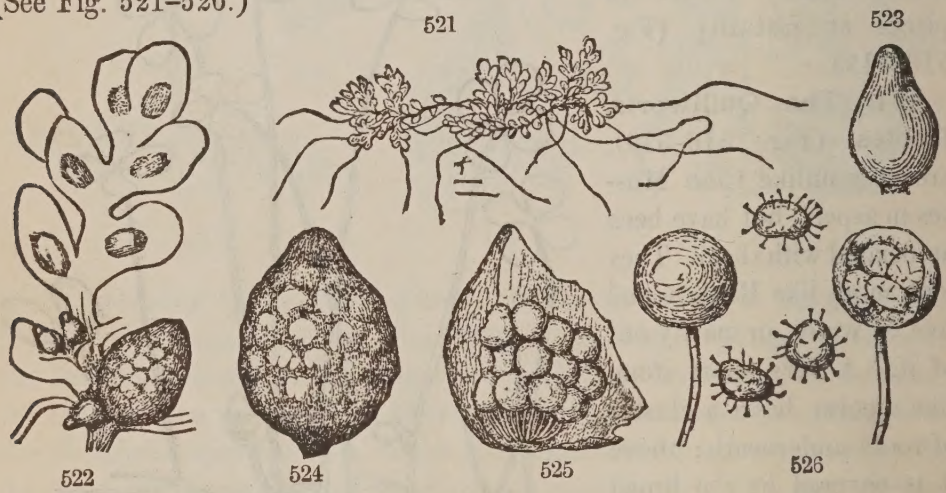
494. **The Quillworts, Isoetes** (Fig. 516–519), are very unlike Club Mosses in aspect, but have been associated with them. They look more like Rushes, and live in water, or partly out of it. A very short stem, like a corm, bears a cluster of roots underneath; above it is covered by the broad bases of a cluster of awl-shaped or thread-shaped leaves. The spore-cases are immersed in the bases of the leaves. The outer leaf-bases contain numerous macrospores; the inner are filled with innumerable microspores.

495. **The Pillworts** (*Marsilia* and *Pilularia*) are low aquatics, which

FIG. 520. Plant of Marsilia quadrifoliata, reduced in size; at the right a pair of sporo-carps of about natural size.

bear globular or pill-shaped fruit (Sporocarps) on the lower part of their leaf-stalks or on their slender creeping stems. The leaves of the commoner species of Marsilia might be taken for four-leaved Clover. (See Fig. 520.) The sporocarps are usually raised on a short stalk. Within they are divided lengthwise by a partition, and then crosswise by several partitions. These partitions bear numerous delicate sacs or spore-cases of two kinds, intermixed. The larger ones contain each a large spore, or macrospore; the smaller contain numerous microspores, immersed in mucilage. At maturity the fruit bursts or splits open at top, and the two kinds of spores are discharged. The large ones in germination produce a small prothallus; upon which the contents of the microspores act in the same way as in Ferns, and with a similar result.

496. Azolla is a little floating plant, looking like a small Liverwort or Moss. Its branches are covered with minute and scale-shaped leaves. On the under side of the branches are found egg-shaped thin-walled sporocarps of two kinds. The small ones open across and discharge microspores; the larger burst irregularly, and bring to view globose spore-cases, attached to the bottom of the sporocarp by a slender stalk. These delicate spore-cases burst and set free about four macrospores, which are fertilized at germination, in the manner of the Pillworts and Quillworts. (See Fig. 521–526.)



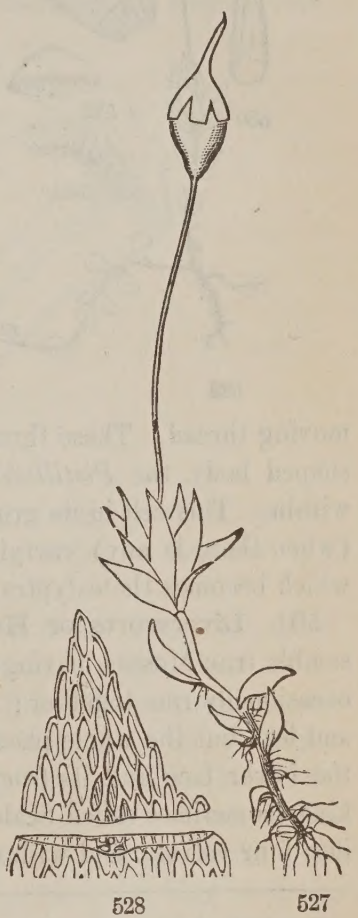
497. Cellular Cryptogams (483) are so called because composed, even in their higher forms, of cellular tissue only, without proper wood-cells or vessels. Many of the lower kinds are mere plates, or ribbons, or simple rows of cells, or even single cells. But their highest orders follow the plan of Ferns and phanerogamous plants in having stem and leaves for their upward growth, and commonly roots, or at least rootlets,

Fig. 521. Small plant of Azolla Caroliniana. 522. Portion magnified, showing the two kinds of sporocarp; the small ones contain microspores; 523 represents one more magnified. 524. The larger sporocarp more magnified. 525. Same more magnified and burst open, showing stalked spore-cases. 526. Two of the latter highly magnified; one of them bursting shows four contained macrospores; between the two, three of these spores highly magnified.

to attach them to the soil, or to trunks, or to other bodies on which they grow. Plants of this grade are chiefly Mosses. So as a whole they take the name of

498. **Bryophyta, Bryophytes** in English form, Bryum being the Greek name of a Moss. These plants are of two principal kinds: true Mosses (*Musci*, which is their Latin name in the plural); and Hepatic Mosses, or Liverworts (*Hepaticæ*).

499. **Mosses or Musci.** The pale Peat-mosses (species of Sphagnum, the principal component of sphagnous bogs) and the strong-growing Hair-cap Moss (Polytrichum) are among the larger and commoner representatives of this numerous family; while Fountain Moss (Fontinalis) in running water sometimes attains the length of a yard or more. On the other hand, some are barely individually distinguishable to the naked eye. Fig. 527 represents a common little Moss, enlarged to about twelve times its natural size; and by its side is part of a leaf, much magnified, showing that it is composed of cellular tissue (parenchyma-cells) only. The leaves of Mosses are always simple, distinct, and sessile on the stem. The fructification is an urn-shaped spore-case, in this as in most cases raised on a slender stalk. The spore-case loosely bears on its summit a thin and pointed cap, like a candle-extinguisher, called a *Calyptra*. Detaching this, it is found that the spore-case is like a pyxis (376), that is, the top at maturity comes off as a lid (*Operculum*); and that the interior is filled with a green powder, the spores, which are discharged through the open mouth. In most Mosses there is a fringe of one or two rows of teeth or membrane around this mouth or orifice, the *Peristome*. When moist the peristome closes hygrometrically over the orifice more or less; when drier the teeth or processes commonly bend outward or recurve; and then the spores more readily escape. In Hair-cap Moss a membrane is stretched quite across the mouth, like a drum-head, retaining the spores until this wears away. See Figures 527–541 for details.



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500. Fertilization in Mosses is by the analogues of stamens and pistils, which are hidden in the axils of leaves, or in the cluster of leaves at the

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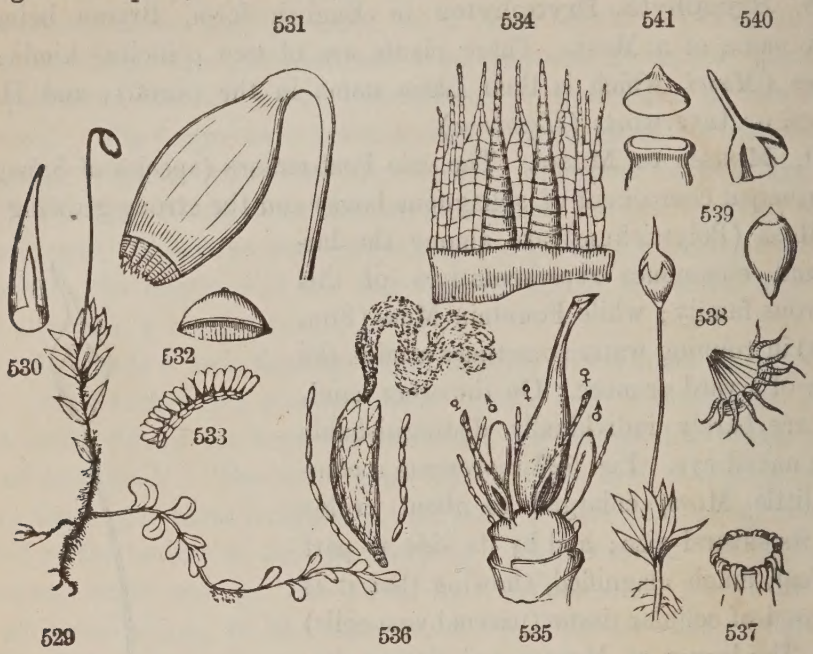
FIG. 527. Single plant of Physcomitrium pyriforme, magnified. 528. Top of a leaf, cut across; it consists of a single layer of cells.

end of the stem. The analogue of the anther (*Antheridium*) is a cellular sac, which in bursting discharges innumerable delicate cells floating in a mucilaginous liquid; each of these bursts and sets free a vibratile self-



moving thread. These threads, one or more, reach the orifice of the pistil-shaped body, the *Pistillidium*, and act upon a particular cell at its base within. This cell in its growth develops into the spore-case and its stalk (when there is any), carrying on its summit the wall of the pistillidium, which becomes the calyptra.

501. **Liverworts or Hepatic Mosses** (*Hepaticæ*) in some kinds resemble true Mosses, having distinct stem and leaves, although their leaves occasionally run together; while in others there is no distinction of stem and leaf, but the whole plant is a leaf-like body, which produces rootlets on the lower face and its fructification on the upper. Those of the moss-like kind (sometimes called Scale-Mosses) have their tender spore-cases splitting into four valves; and with their spores are intermixed some slender spiral

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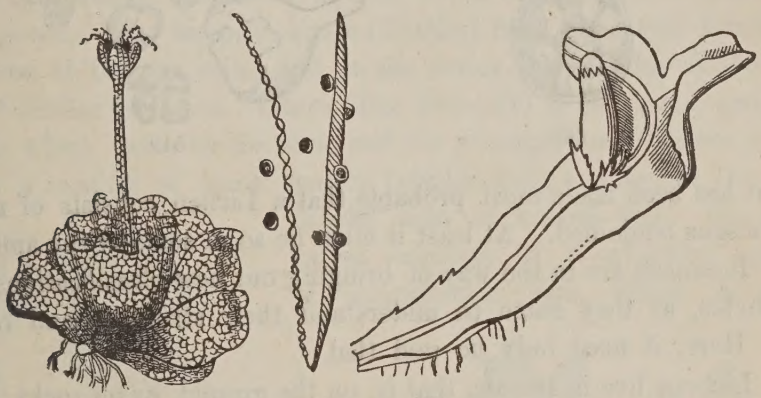
FIG. 529. Mnium cuspidatum, smaller than nature. 530. Its calyptra, detached, enlarged. 531. Its spore-case, with top of stalk, magnified, the lid (532) being detached, the outer peristome appears. 533. Part of a cellular ring (*annulus*) which was under the lid, outside of the peristome, more magnified. 534. Some of the outer and of the inner peristome (consisting of jointed teeth) much magnified. 535. Antheridia and a pistillidium (the so-called flower) at end of a stem of same plant, the leaves torn away (♂, antheridia, ♀, pistillidium), magnified. 536. A bursting antheridium, and some of the accompanying jointed threads, highly magnified. 537. Summit of an open spore-case of a Moss, which has a peristome of 16 pairs of teeth. 538. The double peristome of a Hypnum. 539–541. Spore-case, detached calyptra, and top of more enlarged spore-case and detached lid, of Physcomitrium pyriforme (Fig. 527): orifice shows that there is no peristome.

and very hygrometric threads (called *Elaters*) which are thought to aid in the dispersion of the spores. (Fig. 542–544.)

502. Marchantia, the commonest and largest of the true Liverworts, forms large green plates or fronds on damp and shady ground, and sends up from some part of the upper face a stout stalk, ending in a several-lobed umbrella-shaped body, under the lobes of which hang several thin-walled spore-cases, which burst open and discharge spores and elaters. Riccia natans (Fig. 545) consists of wedge-shaped or heart-shaped fronds, which float free in pools of still water. The under face bears copious rootlets; in the substance of the upper face are the spore-cases, their pointed tips



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merely projecting: there they burst open, and discharge their spores. These are comparatively few and large, and are in fours; so they are very like the macrospores of Pillworts or Quillworts.

503. **Thallophyta, or Thallophytes** in English form. This is the name for the lower class of Cellular Cryptogams, — plants in which there is no marked distinction into root, stem, and leaves. Roots in any proper sense they never have, as organs for absorbing, although some of the larger Seaweeds (such as the Sea Colander, Fig. 553) have them as holdfasts. Instead of axis and foliage, there is a stratum of frond, in such plants commonly called a THALLUS (by a strained use of a Greek and Latin word which means a green shoot or bough), which may have any kind of form, leaf-like, stem-like, branchy, extended to a flat plate, or gathered into a sphere, or drawn out into threads, or reduced to a single row of cells, or even reduced to single cells. Indeed, Thallophytes are so multifarious, so numerous in kinds, so protean in their stages and transformations, so recondite in their fructification, and many so microscopic in size, either of

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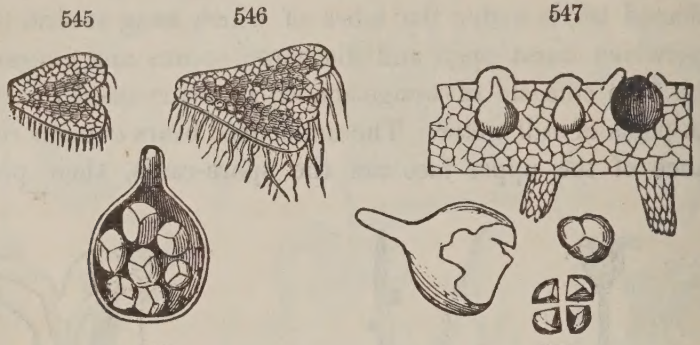
FIG. 542. Fructification of a Jungermannia, magnified; its cellular spore-stalk, surrounded at base by some of the leaves, at summit the 4-valved spore-case opening, discharging spores and elaters. 543. Two elaters and some spores from the same, highly magnified.

FIG. 544. One of the frondose Liverworts, Steetzia, otherwise like a Jungermannia; the spore-case not yet protruded from its sheath.

the plant itself or its essential organs, that they have to be elaborately described in separate books and made subjects of special study.

504. Nevertheless, it may be well to try to give some general idea of what Algæ and Lichens and Fungi are. Linnæus had them all under the orders of Algæ and Fungi. Afterwards the Lichens were separated; but



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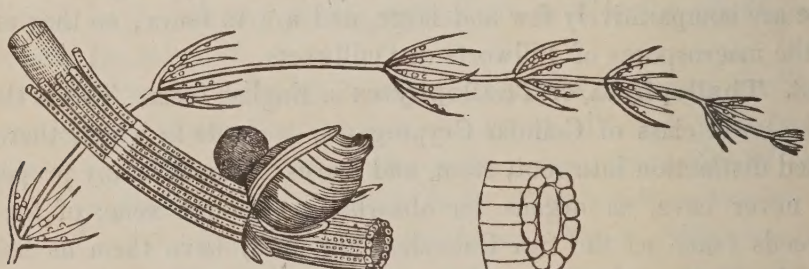
of late it has been made most probable that a Lichen consists of an Alga and a Fungus conjoined. At least it must be so in some of the ambiguous forms. Botanists are in the way of bringing out new classifications of the Thallophytes, as they come to understand their structure and relations better. Here, it need only be said that

505. Lichens live in the air, that is, on the ground, or on rocks, trunks, walls, and the like, and grow when moistened by rains. They assimilate air, water, and some earthy matter, just as do ordinary plants. Algæ, or Sea-



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weeds, live in water, and live the same kind of life as do ordinary plants. Fungi, whatever medium they inhabit, live as animals do, upon organic matter, — upon what other plants have assimilated, or upon the products of

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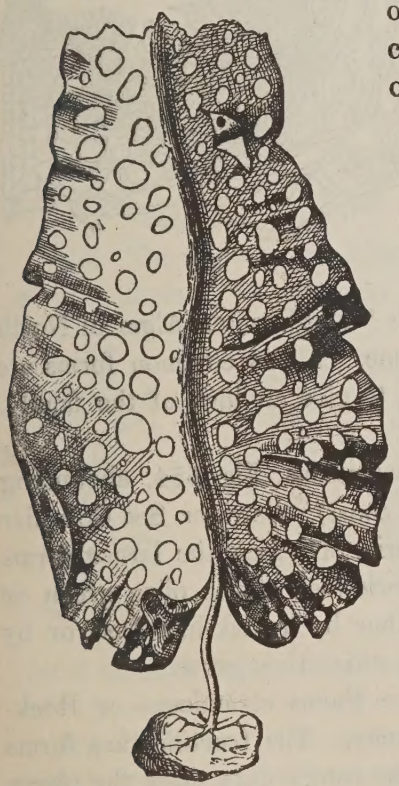
Fig. 545, 546. Two plants of Riccia natans, about natural size. 547. Magnified section of a part of the frond, showing two immersed spore-cases, and one emptied space. 548. Magnified section of a spore-case with some spores. 549. Magnified spore-case torn out, and spores; one figure of the spores united; the other of the four separated.

Fig. 550. Branch of a Chara, about natural size. 551. A fruiting portion, magnified, showing the structure; a sporocarp, and an antheridium. 552. Outlines of a portion of the stem in section, showing the central cell and the outer or cortical cells.

their decay. True as these general distinctions are, it is no less true that these orders run together in their lowest forms; and that Algæ and Fungi may be traced down into forms so low and simple that no clear line can be drawn between them; and even into forms of which it is uncertain whether they should be called plants or animals. It is as well to say that they are not high enough in rank to be distinctively either the one or the other. On the other hand there is a peculiar group of plants, which in simplicity of composition resemble the simpler Algæ, while in fructification and in the arrangements of their simple cells into stem and branches they seem to be of a higher order, viz.: —

506. **Characeæ.** These are aquatic herbs, of considerable size, abounding in ponds. The simpler kinds (Nitella) have the stem formed of a single row of tubular cells, and at the nodes, or junction of the cells, a whorl of similar branches. Chara (Fig. 550–552) is the same, except that the cells which make up the stem and the principal branches are strengthened by a coating of many smaller tubular cells, applied to the surface of the main or central cell. The fructification consists of a globular sporocarp of considerable size, which is spirally



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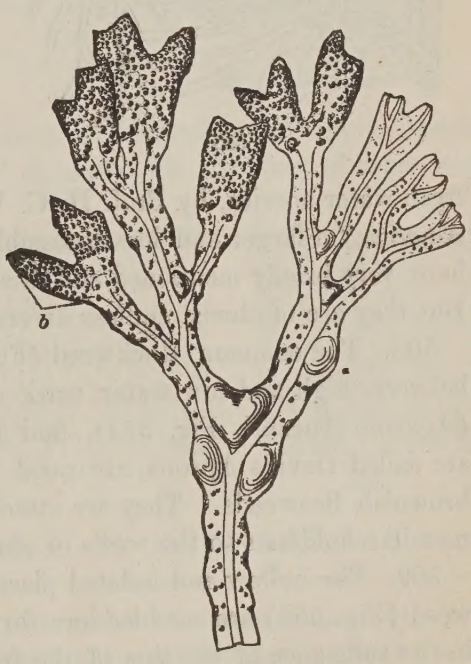

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enwrapped by tubular cells twisted around it: by the side of this is a smaller and globular antheridium. The latter breaks up into eight shield-

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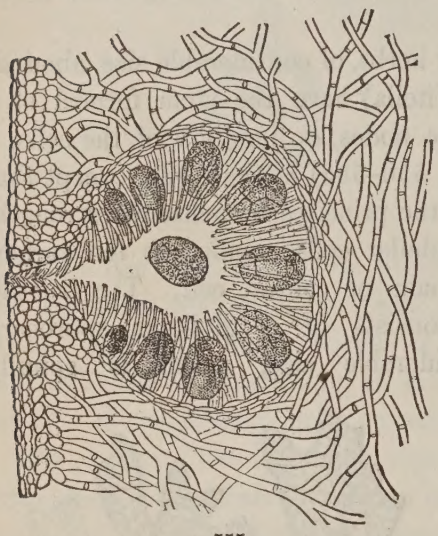
Fig. 553. Agarum Turneri, Sea Colander (so called from the perforations with which the frond, as it grows, becomes riddled); very much reduced in size.

Fig. 554. Upper end of a Rockweed, Fucus vesiculosus, reduced half or more, *b*, the fructification.

shaped pieces, with an internal stalk, and bearing long and ribbon shaped filaments, which consist of a row of delicate cells, each of which discharges a free-moving microscopic thread (the analogue of the pollen or pollen-tube), nearly in the manner of Ferns and Mosses. One of these threads reaches and fertilizes a cell at the apex of the nucleus or solid body of the sporocarp. This subsequently germinates and forms a new individual.

507. **Algæ or Seaweeds.** The proper Seaweeds may be studied by the aid of Professor Farlow's "Marine Algæ of New England;" the



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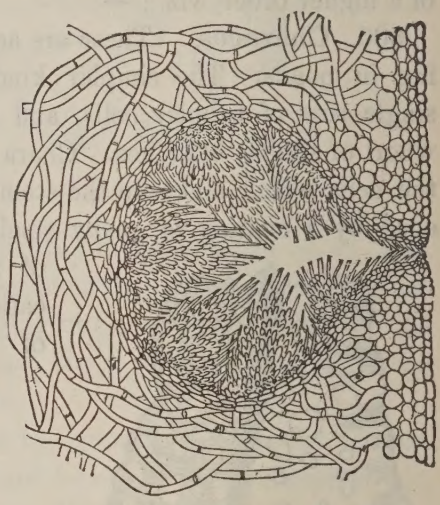

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fresh-water species, by Prof. H. C. Woods's "Fresh-water Algæ of North America," a larger and less accessible volume. A few common forms are here very briefly mentioned and illustrated, to give an idea of the family. But they are of almost endless diversity.

508. The common Rockweed (Fucus vesiculosus, Fig. 554, abounding between high and low water mark on the coast), the rarer Sea Colander (Agarum Turneri, Fig. 553), and Laminaria, of which the larger forms are called Devil's Aprons, are good representatives of the olive green or brownish Seaweeds. They are attached either by a disk-like base or by root-like holdfasts to the rocks or stones on which they grow.

509. The hollow and inflated places in the Fucus vesiculosus or Rockweed (Fig. 554) are air-bladders for buoyancy. The fructification forms in the substance of the tips of the frond: the rough dots mark the places where the conceptacles open. The spores and the fertilizing cells are in different plants. Sections of the two kinds of conceptacles are given in Fig. 555 and 556. The contents of the conceptacles are discharged through

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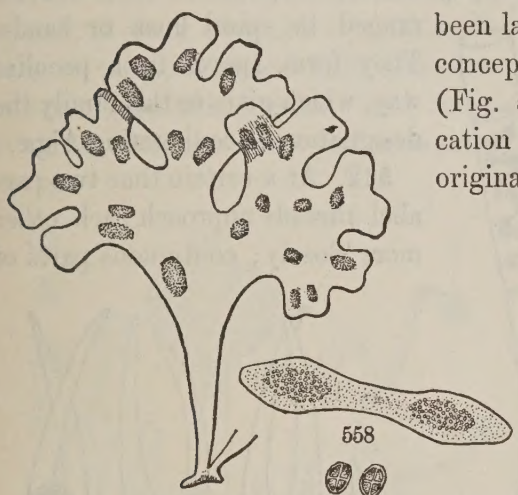
FIG. 555. Magnified section through a fertile conceptacle of Rockweed, showing the large spores in the midst of threads of cells. 556. Similar section of a sterile conceptacle, containing slender antheridia. From Farlow's "Marine Algæ of New England."

a small orifice which in each figure is at the margin of the page. The large spores are formed eight together in a mother-cell. The minute motile filaments of the antheridia fertilize the large spores after injection into the water: and then the latter promptly acquire a cell-wall and germinate.

510. The Florideæ or Rose-red series of marine Algæ (which, however, are sometimes green or brownish) are the most attractive to amateurs. The delicate Porphyra or Laver is in some countries eaten as a delicacy, and the cartilaginous Chondrus crispus has been largely used for jelly. Besides their conceptacles, which contain true spores (Fig. 560), they mostly have a fructification in *Tetraspores*, that is, of spores originating in fours (Fig. 559).



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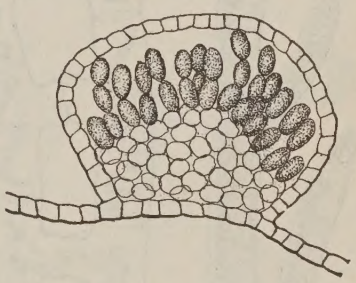

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511. The Grass-green Algæ sometimes form broad membranous fronds, such as those of the common Ulva of the sea-shore, but most of them form

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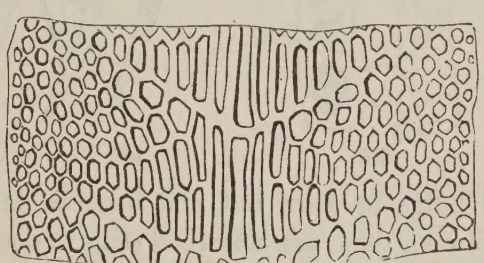

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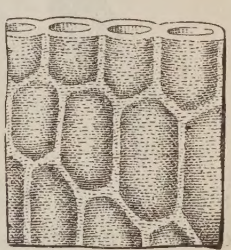

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mere threads, either simple or branched. To this division belong almost

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Fig. 557. Small plant of Chondrus crispus, or Carrageen Moss, reduced in size, in fruit; the spots represent the fructification, consisting of numerous tetraspores in bunches in the substance of the plant. 558. Section through the thickness of one of the lobes, magnified, passing through two of the imbedded fruit-clusters. 559. Two of its tetraspores (spores in fours), highly magnified.

Fig. 560. Section through a conceptacle of Delesseria Leprieurei, much magnified, showing the spores, which are single specialized cells, two or three in a row.

Fig. 561. A piece of the rose-red Delesseria Lepreiurei, double natural size. 562. A piece cut out and much magnified, showing that it is composed of a layer of cells. 563. A few of the cells more highly magnified: the cells are gelatinous and thick-walled.

all the Fresh-water Algæ, such as those which constitute the silky threads or green slime of running streams or standing pools, and which were all called Confervas before their immense diversity was known. Some are formed of a single row of cells, developed each from the end of another. Others branch, the top of one cell producing more than one new one (Fig. 564). Others, of a kind which is very common in fresh water, simple threads made of a line of cells, have the chlorophyll and protoplasm of each cell arranged in spiral lines or bands. They form spores in a peculiar way, which gives to this family the designation of conjugating Algæ.

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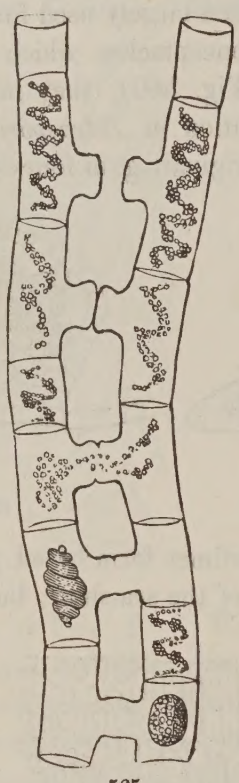

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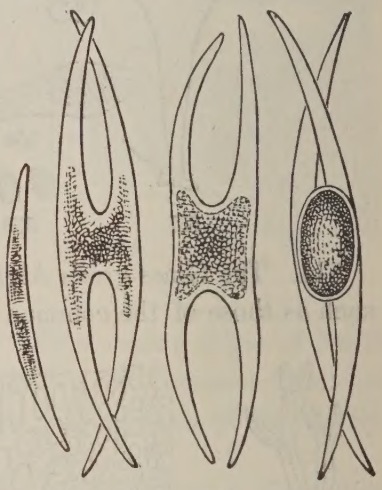
512. At a certain time two parallel threads approach each other more closely; contiguous parts of



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a cell of each thread bulge or grow out, and unite when they meet; the cell-wall partitions between them are absorbed so as to open a free communication; the spiral band of green matter in both cells breaks up; the whole of that of one cell passes over into the other; and of the united contents a large green spore is formed. Soon the old cells decay, and the spore

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Fig. 564. The growing end of a branching Conferva (Cladophora glomerata), much magnified; showing how, by a kind of budding growth, a new cell is formed by a cross partition separating the newer tip from the older part below; also, how the branches arise.

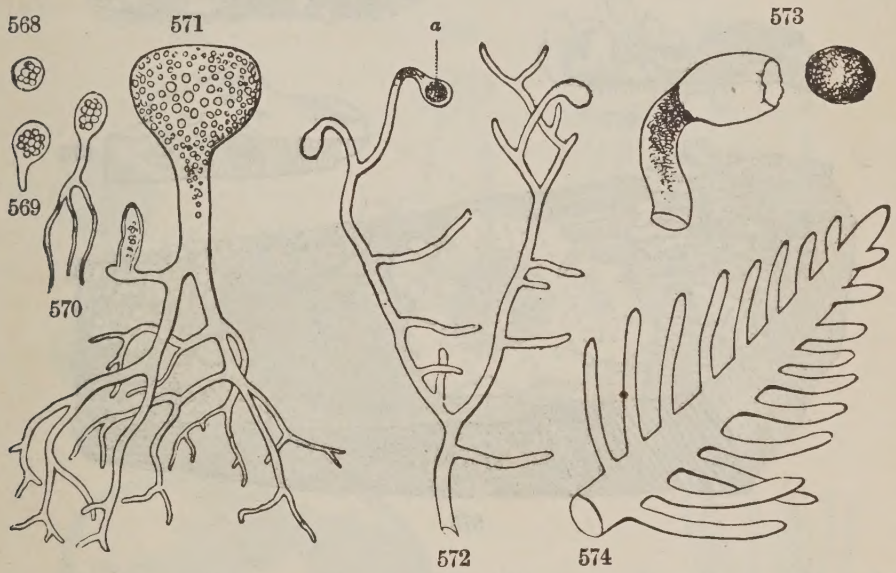
Fig. 565. Two magnified individuals of a Spirogyra, forming spores by conjugation; a completed spore at base: above, successive stages of the conjugation are represented.

Fig. 566. Closterium acutum, a common Desmid, moderately magnified. It is a single firm-walled cell, filled with green protoplasmic matter.

Fig. 567. More magnified view of three stages of the conjugation of a pair of the same.

set free is ready to germinate. Fig. 565 represents several stages of the conjugating process, which, however, would never be found all together like this in one pair of threads.

513. Desmids and Diatomes, which are microscopic one-celled plants of the same class, conjugate in the same way, as is shown in a Closterium by Fig. 566, 567. Here the whole living contents of two individuals are incorporated into one spore, for a fresh start. A reproduction which costs the life of two individuals to make a single new one would be fatal to the species if there were not a provision for multiplication by the prompt division of the new-formed individual into two, and these again into two, and so on in geometrical ratio. And the costly process would be meaningless if there were not some real advantage in such a fresh start, that is, in sexes.



514. There are other Algæ of the grass-green series which consist of single cells, but which by continued growth form plants of considerable size. Three kinds of these are represented in Fig. 568–574.

515. **Lichens**, Latin *Lichenes*, are to be studied in the works of the late Professor Tuckerman, but a popular exposition is greatly needed. The subjoined illustrations (Fig. 575–580) may simply indicate what some of the commoner forms are like. The cup, or shield-shaped spot, or knob, which bears the fructification is named the *Apothecium*. This is mainly

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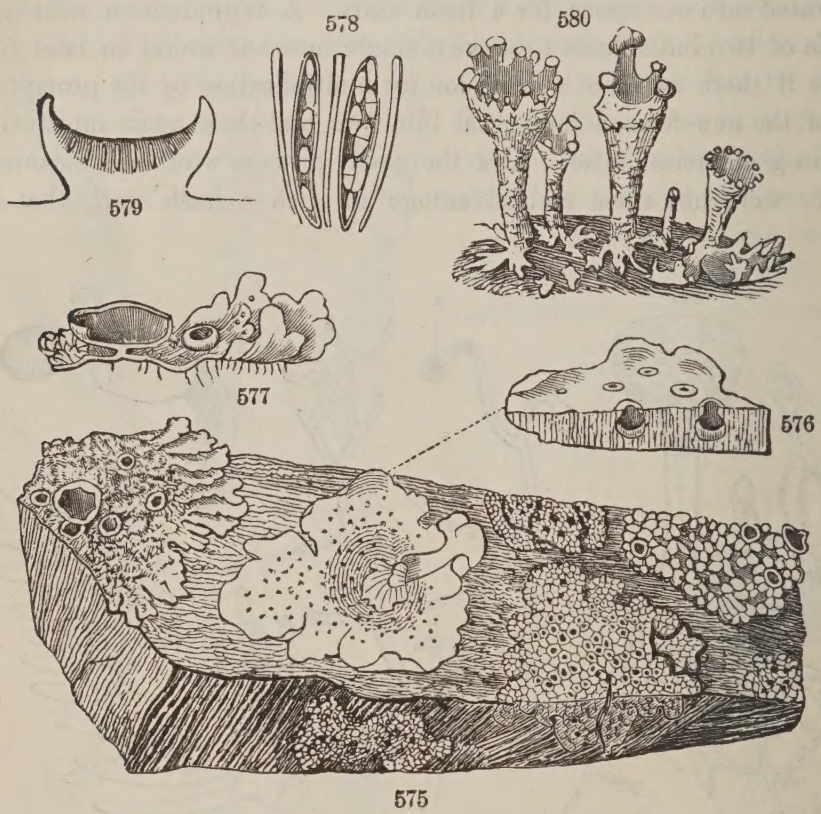
FIG. 568. Early stage of a species of Botrydium, a globose cell. 569, 570. Stages of growth. 571. Full-grown plant, extended and ramified below in a root-like way. 572. A Vaucheria; single cell grown on into a much-branched thread; the end of some branches enlarging, and the green contents in one (*a*) there condensed into a spore. 573. More magnified view of *a*, and the mature spore escaping. 574. Bryopsis plumosa; apex of a stem with its branchlets; all the extension of one cell. Variously magnified.

composed of slender sacs (*Asci*), having thread-shaped cells intermixed; and each ascus contains few or several spores, which are commonly double or treble. Most Lichens are flat expansions of grayish hue; some of them foliaceous in texture, but never of bright green color; more are crustaceous; some are wholly pulverulent and nearly formless. But in several the vegetation lengthens into an axis (as in Fig. 580), or imitates stem



and branches or threads, as in the Reindeer-Moss on the ground in our northern woods, and the Usnea hanging from the boughs of old trees overhead.

516. **Fungi.** For this immense and greatly diversified class, it must here suffice to indicate the parts of a Mushroom, a Sphæria, and of one or two common Moulds. The true vegetation of common Fungi consists of slender cells which form what is called a *Mycelium*. These filamentous

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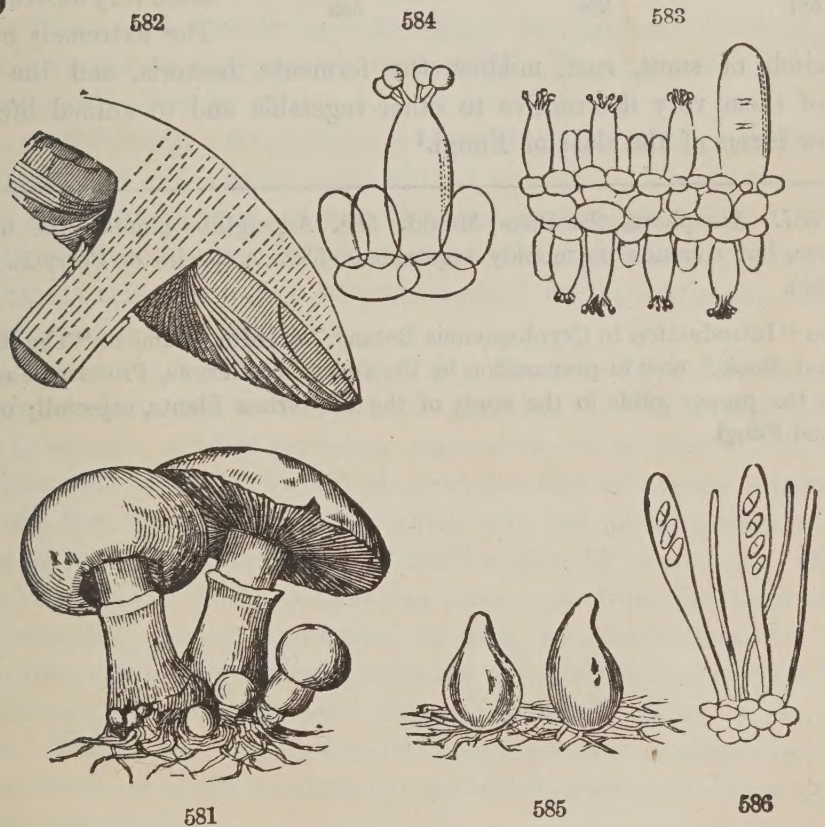
FIG. 575. A stone on which various Lichens are growing, such as (passing from left to right) a Parmelia, a Sticta, and on the right, Lecidia geographica, so called from its patches resembling the outline of islands or continents as depicted upon maps. 576. Piece of thallus of Parmelia conspersa, with section through an apothecium. 577. Section of a smaller apothecium, enlarged. 578. Two asci of same, and contained spores, and accompanying filaments; more magnified. 579. Piece of thallus of a Sticta, with section, showing the immersed apothecia; the small openings of these dot the surface. 580. Cladonia coccinea; the fructification is in the scarlet knobs, which surround the cups.

cells lengthen and branch, growing by the absorption through their whole surface of the decaying, or organizable, or living matter which they feed upon. In a Mushroom (Agaricus), a knobby mass is at length formed, which develops into a stout stalk (*Stipe*), bearing the cap (*Pileus*) : the under side of the cap is covered by the *Hymenium*, in this genus consisting of radiating plates, the gills or *Lamellæ;* and these bear the powdery spores in immense numbers. Under the microscope, the gills are found to be studded with projecting cells, each of which, at the top, produces four stalked spores. These form the powder which collects on a sheet of paper upon which a mature Mushroom is allowed to rest for a day or two. (Fig. 581–586.)

517. The esculent Morel, also Sphæria (Fig. 585, 586), and many other Fungi bear their spores in sacs (asci) exactly in the manner of Lichens (515)

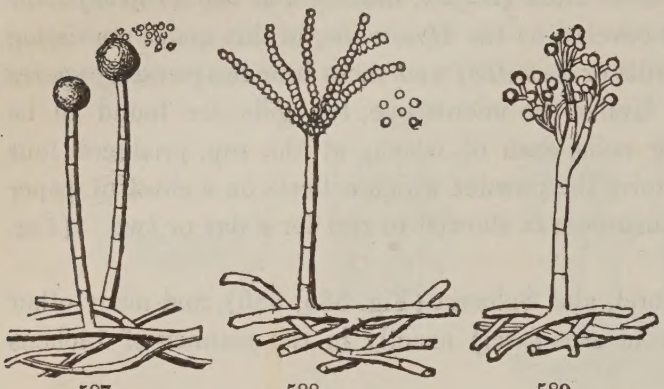


518. Of the Moulds, one of the commoner is the Bread-Mould (Fig. 587). In fruiting it sends up a slender stalk, which bears a globular sac;

Fig. 581. Agaricus campestris, the common edible Mushroom. 582. Section of cap and stalk. 583. Minute portion of a section of a gill, showing some spore-bearing cells, much magnified. 584. One of these, with its four spores, more magnified.

Fig. 585. Sphæria rosella. 586. Two of the asci and contained double spores, quite like those of a Lichen; much magnified.

this bursts at maturity and discharges innumerable spores. The blue Cheese-Mould (Fig. 588) bears a cluster of branches at top, each of which is a row of naked spores, like a string of beads, all breaking apart at maturity. Botrytis (Fig. 589), the fruiting stalk of which branches, and each branch is tipped with a spore, is one of the many moulds which live and feed upon the juices of other plants or of animals, and are often very destructive. The extremely numerous kinds of smut, rust, mildew, the ferments, bacteria, and the like, many of them very destructive to other vegetable and to animal life, are also low forms of the class of Fungi.[1]



587 588 589

FIG. 587. Ascophora, the Bread-Mould. 588. Aspergillus glaucus, the mould of cheese, but common on mouldy vegetables. 589. A species of Botrytis. All magnified.

[1] The "Introduction to Cryptogamous Botany," or third volume of "The Botanical Text Book," now in preparation by the author's colleague, Professor Farlow, will be the proper guide in the study of the Flowerless Plants, especially of the Algæ and Fungi.

SECTION XVIII. CLASSIFICATION AND NOMENCLATURE.

519. Classification, in botany, is the consideration of plants in respect to their kinds and relationships. Some system of Nomenclature, or naming, is necessary for fixing and expressing botanical knowledge so as to make it available. The vast multiplicity of plants and the various degrees of their relationship imperatively require order and system, not only as to *names* for designating the kinds of plants, but also as to *terms* for defining their differences. Nomenclature is concerned with the names of plants. Terminology supplies names of organs or parts, and terms to designate their differences.

§ 1. KINDS AND RELATIONSHIP.

520. Plants and animals have two great peculiarities: 1st, they form themselves; and 2d, they multiply themselves. They reproduce their kind in a continued succession of

521. **Individuals.** Mineral things occur as *masses*, which are divisible into smaller and still smaller ones without alteration of properties. But organic things (vegetables and animals) exist as *individual beings*. Each owes its existence to a parent, and produces similar individuals in its turn. So each individual is a link of a chain; and to this chain the natural-historian applies the name of

522. **Species.** All the descendants from the same stock therefore compose one species. And it was from our observing that the several sorts of plants or animals steadily reproduce themselves, or, in other words, keep up a succession of similar individuals, that the idea of species originated. There are few species, however, in which man has actually observed the succession for many generations. It could seldom be proved that all the White Pine trees or White Oaks of any forest came from the same stock. But observation having familiarized us with the general fact that individuals proceeding from the same stock are essentially alike, we infer from their close resemblance that these similar individuals belong to the same species. That is, we infer it when the individuals are as much like each other as those are which we know, or confidently suppose, to have sprung from the same stock.

523. Identity in species is inferred from close similarity in all essential respects, or whenever the differences, however considerable, are not known or reasonably supposed to have been originated in the course of time under changed conditions. No two individuals are exactly alike; a tendency to variation pervades all living things. In cultivation, where variations are looked after and cared for, very striking differences come to light; and if in wild nature they are less common or less conspicuous, it is partly because they are uncared for. When such variant forms are pretty well marked they are called

524. **Varieties.** The White Oak, for example, presents two or three varieties in the shape of the leaves, although they may be all alike upon each particular tree. The question often arises, and it is often hard to answer, whether the difference in a particular case is that of a variety, or is specific. If the former, it may commonly be proved by finding such intermediate degrees of difference in various individuals as to show that no clear distinction can be drawn between them; or else by observing the variety to vary back again in some of its offspring. The sorts of Apples, Pears, Potatoes, and the like, show that differences which are permanent in the individual, and continue unchanged through a long series of generations when propagated by division (as by offsets, cuttings, grafts, bulbs, tubers, etc.), are not likely to be reproduced by seed. Still they sometimes are so, and perhaps always tend in that direction. For the fundamental law in organic nature is that offspring shall be like parent.

Races are such strongly marked varieties, capable of coming true to seed. The different sorts of Wheat, Maize, Peas, Radishes, etc., are familiar examples. By selecting those individuals of a species which have developed or inherited any desirable peculiarity, keeping them from mingling with their less promising brethren, and selecting again the most promising plants raised from their seeds, the cultivator may in a few generations render almost any variety transmissible by seed, so long as it is cared for and kept apart. In fact, this is the way the cultivated domesticated races, so useful to man, have been fixed and preserved. Races, in fact, can hardly, if at all, be said to exist independently of man. But man does not really produce them. Such peculiarities — often surprising enough — now and then originate, we know not how (the plant *sports*, as the gardeners say); they are only preserved, propagated, and generally further developed, by the cultivator's skilful care. If left alone, they are likely to dwindle and perish, or else revert to the original form of the species. Vegetable races are commonly annuals, which can be kept up only by seed, or herbs of which a succession of generations can be had every year or two, and so the education by selection be completed without great lapse of time. But all fruit-trees could probably be fixed into races in an equal number of generations.

Bud-varieties are those which spring from buds instead of seed. They are uncommon to any marked extent. They are sometimes called *Sports*, but this name is equally applied to variations among seedlings.

Cross-breeds, strictly so-called, are the variations which come from cross-fertilizing one variety of a species with another.

Hybrids are the varieties, if they may be so called, which come from the crossing of species (331). Only nearly related species can be hybridized; and the resulting progeny is usually self-sterile, but not always. Hybrid plants, however, may often be fertilized and made prolific by the pollen of one or the other parent. This produces another kind of cross-breeds.

525. Species are the units in classification. Varieties, although of

utmost importance in cultivation and of considerable consequence in the flora of any country, are of less botanical significance. For they are apt to be indefinite and to shade off one form into another. But species, the botanist *expects* to be distinct. Indeed, the practical difference to the botanist between species and varieties is the definite limitation of the one and the indefiniteness of the other. The botanist's determination is partly a matter of observation, partly of judgment.

526. In an enlarged view, varieties may be incipient species; and nearly related species probably came from a common stock in earlier times. For there is every reason to believe that existing vegetation came from the more or less changed vegetation of a preceding geological era. However that may be, species are regarded as permanent and essentially unchanged in their succession of individuals through the actual ages.

527. There are, at nearly the lowest computation, as many as one hundred thousand species of phanerogamous plants, and the cryptogamous species are thought to be still more numerous. They are all connected by resemblances or relationships, near and remote, which show that they are all parts of one system, realizations in nature, as we may affirm, of the conception of One Mind. As we survey them, they do not form a single and connected chain, stretching from the lowest to the highest organized species, although there obviously are lower and higher grades. But the species throughout group themselves, as it were, into clusters or constellations, and these into still more comprehensive clusters, and so on, with gaps between. It is this clustering which is the ground of the recognition of *kinds* of species, that is, of groups of species of successive grades or degree of generality; such as that of similar species into *Genera*, of genera into *Families* or *Orders*, of orders into *Classes*. In classification the sequence, proceeding from higher or more general to lower or special, is always Class, Order, Genus, Species, Variety (if need be).

528. Genera (in the singular, *Genus*) are assemblages of closely related species, in which the essential parts are all constructed on the same particular type or plan. White Oak, Red Oak, Scarlet Oak, Live Oak, etc., are so many species of the Oak genus (Latin, *Quercus*). The Chestnuts compose another genus; the Beeches another. The Apple, Pear, and Crab are species of one genus, the Quince represents another, the various species of Hawthorn a third. In the animal kingdom the common cat, the wild-cat, the panther, the tiger, the leopard, and the lion are species of the cat kind or genus; while the dog, the jackal, the different species of wolf, and the foxes, compose another genus. Some genera are represented by a vast number of species, others by few, very many by only one known species. For the genus may be as perfectly represented in one species as in several, although, if this were the case throughout, genera and species would of course be identical. The Beech genus and the Chestnut genus would be just as distinct from the Oak genus even if but one Beech and one Chestnut were known; as indeed was once the case.

529. **Orders** are groups of genera that resemble each other; that is, they are to genera what genera are to species. As familiar illustrations, the Oak, Chestnut, and Beech genera, along with the Hazel genus and the Hornbeams, all belong to one order. The Birches and the Alders make another; the Poplars and Willows, another; the Walnuts (with the Butternut) and the Hickories, still another. The Apple genus, the Quince and the Hawthorns, along with the Plums and Cherries and the Peach, the Raspberry with the Blackberry, the Strawberry, the Rose, belong to a large order, which takes its name from the Rose. Most botanists use the names "Order" and "Family" synonymously; the latter more popularly, as "the Rose Family," the former more technically, as "Order *Rosaceæ*."

530. But when the two are distinguished, as is common in zoölogy, Family is of lower grade than Order.

531. **Classes** are still more comprehensive assemblages, or great groups. Thus, in modern botany, the Dicotyledonous plants compose one class, the Monocotyledonous plants another (36–40).

532. These four grades, Class, Order, Genus, Species, are of universal use. Variety comes in upon occasion. For, although a species may have no recognized varieties, a genus implies at least one species belonging to it; every genus is of some order, and every order of some class.

533. But these grades by no means exhaust the resources of classification, nor suffice for the elucidation of all the distinctions which botanists recognize. In the first place, a higher grade than that of class is needful for the most comprehensive of divisions, that of all plants into the two *Series* of Phanerogamous and Cryptogamous (6); and in natural history there are the two *Kingdoms* or *Realms*, the Vegetable and the Animal.

534. Moreover, the stages of the scaffolding have been variously extended, as required, by the recognition of assemblages lower than class but higher than order, viz. *Subclass* and *Cohort;* or lower than order, a *Suborder;* or between this and genus, a *Tribe;* or between this and tribe, a *Subtribe;* or between genus and species, a *Subgenus;* and by some a species has been divided into *Subspecies*, and a variety into *Subvarieties*. Last of all are *Individuals*. Suffice it to remember that the following are the principal grades in classification, with the proper sequence; also that only those here printed in small capitals are fundamental and universal in botany: —

SERIES,
CLASS, Subclass, Cohort,
ORDER, or FAMILY, Suborder, Tribe, Subtribe,
GENUS, Subgenus or Section,
SPECIES, Variety.

§ 2. NAMES, TERMS, AND CHARACTERS.

535. The name of a plant is the name of its genus followed by that of the species. The name of the genus answers to the surname (or family name); that of the species to the baptismal name of a person. Thus *Quercus* is the name of the Oak genus; *Quercus alba*, that of the White Oak, *Q. rubra*, that of Red Oak, *Q. nigra*, that of the Black-Jack, etc. Botanical names being Latin or Latinized, the adjective name of the species comes after that of the genus.

536. **Names of Genera** are of one word, a substantive. The older ones are mostly classical Latin, or Greek adopted into Latin; such as *Quercus* for the Oak genus, *Fagus* for the Beech, *Corylus*, the Hazel, and the like. But as more genera became known, botanists had new names to make or borrow. Many are named from some appearance or property of the flowers, leaves, or other parts of the plant. To take a few examples from the early pages of the "Manual of the Botany of the Northern United States," — the genus *Hepatica* comes from the shape of the leaf, resembling that of the liver. *Myosurus* means mouse-tail. *Delphinium* is from delphin, a dolphin, and alludes to the shape of the flower, which was thought to resemble the classical figures of the dolphin. *Xanthorrhiza* is from two Greek words meaning yellow-root, the common name of the plant. *Cimicifuga* is formed of two Latin words meaning to drive away bugs, i. e. Bugbane, the Siberian species being used to keep away such vermin. *Sanguinaria*, the Bloodroot, is named from the blood-like color of its juice. Other genera are dedicated to distinguished botanists or promoters of science, and bear their names: such are *Magnolia*, which commemorates the early French botanist, Magnol; and *Jeffersonia*, named after President Jefferson, who sent the first exploring expedition over the Rocky Mountains. Others bear the name of the discoverer of the plant; as, *Sarracenia*, dedicated to Dr. Sarrazin, of Quebec, who was one of the first to send the common Pitcher-plant to the botanists of Europe; and *Claytonia*, first made known by the early Virginian botanist Clayton.

537. **Names of Species.** The name of a species is also a single word, appended to that of the genus. It is commonly an adjective, and therefore agrees with the generic name in case, gender, etc. Sometimes it relates to the country the species inhabits; as, Claytonia *Virginica*, first made known from Virginia; Sanguinaria *Canadensis*, from Canada, etc. More commonly it denotes some obvious or characteristic trait of the species; as, for example, in Sarracenia, our northern species is named *purpurea*, from the purple blossoms, while a more southern one is named *flava*, because its petals are yellow; the species of Jeffersonia is called *diphylla*, meaning two-leaved, because its leaf is divided into two leaflets. Some species are named after the discoverer, or in compliment to a botanist who has made them known; as, Magnolia *Fraseri*, named after the botanist Fraser, one

of the first to find this species; and Sarracenia *Drummondii*, for a Pitcher-plant found by Mr. Drummond in Florida. Such personal specific names are of course written with a capital initial letter. Occasionally some old substantive name is used for the species; as Magnolia *Umbrella*, the Umbrella tree, and Ranunculus *Flammula*. These are also written with a capital initial, and need not accord with the generic name in gender. Geographical specific names, such as *Canadensis*, *Caroliniana*, *Americana*, in the later usage are by some written without a capital initial, but the older usage is better, or at least more accordant with English orthography.

538. **Varietal Names**, when any are required, are made on the plan of specific names, and follow these, with the prefix *var.* Ranunculus Flammula, var. *reptans*, the creeping variety: R. abortivus, var. *micranthus*, the small-flowered variety of the species.

539. In recording the name of a plant it is usual to append the name, or an abbreviation of the name, of the botanist who first published it; and in a flora or other systematic work, this reference to the source of the name is completed by a further citation of the name of the book, the volume and page where it was first published. So "*Ranunculus acris*, L.," means that this Buttercup was first so named and described by Linnæus; "*R. multifidus*, Pursh," that this species was so named and published by Pursh. The suffix is no part of the name, but is an abbreviated reference, to be added or omitted as convenience or definiteness may require. The authority for a generic name is similarly recorded. Thus, "*Ranunculus*, L.," means that the genus was so named by Linnæus; "*Myosurus*, Dill.," that the Mouse-tail was established as a genus under this name by Dillenius; *Caulophyllum*, Michx., that the Blue Cohosh was published under this name by Michaux. The full reference in the last-named instance would be, "in Flora Boreali-Americana, first volume, 205th page," — in the customary abbreviation, "Michx. Fl. i. 205."

540. **Names of Orders** are given in the plural number, and are commonly formed by prolonging the name of a genus of the group taken as a representative of it. For example, the order of which the Buttercup or Crowfoot genus, *Ranunculus*, is the representative, takes from it the name of *Ranunculaceæ*; meaning *Plantæ Ranunculaceæ* when written out in full, that is, Ranunculaceous Plants. Some old descriptive names of orders are kept up, such as *Cruciferæ* for the order to which Cress and Mustard belong, from the cruciform appearance of their expanded corolla, and *Umbelliferæ*, from the flowers being in umbels.

541. **Names of Tribes**, also of suborders, subtribes, and the like, are plurals of the name of the typical genus, less prolonged, usually in *eæ*, *ineæ*, *ideæ*, etc. Thus the proper Buttercup tribe is *Ranunculeæ*, of the Clematis tribe, *Clematideæ*. While the Rose family is *Rosaceæ*, the special Rose tribe is *Roseæ*.

542. **Names of Classes, etc.** For these see the following synopsis of the actual classification adopted, p. 183.

543. So a plant is named in two words, the generic and the specific names, to which may be added a third, that of the variety, upon occasion. The generic name is peculiar: obviously it must not be used twice over in botany. The specific name must not be used twice over in the same genus, but is free for any other genus. A *Quercus alba*, or White Oak, is no hindrance to *Betula alba*, or White Birch; and so of other names.

544. **Characters and Descriptions.** Plants are *characterized* by a terse statement, in botanical terms, of their peculiarities or distinguishing marks. The character of the order should include nothing which is common to the whole class it belongs to; that of the genus, nothing which is common to the order; that of the species nothing which is shared with all other species of the genus; and so of other divisions. *Descriptions* may enter into complete details of the whole structure.

545. **Terminology**, also called *Glossology*, is nomenclature applied to organs or parts, and their forms or modifications. Each organ or special part has a substantive name of its own: shapes and other modifications of an organ or part are designated by adjective terms, or, when the forms are peculiar, substantive names are given to them. By the correct use of such botanical terms, and by proper subordination of the characters under the order, genus, species, etc., plants may be described and determined with much precision. The classical language of botany is Latin. While modern languages have their own names and terms, these usually lack the precision of the Latin or Latinized botanical terminology. Fortunately, this Latinized terminology has been largely adopted and incorporated into the English technical language of botany, thus securing precision. And these terms are largely the basis of specific names of plants.

546. A glossary or vocabulary of the principal botanical terms used in phanerogamous and vascular cryptogamous botany is appended to this volume, to which the student may refer, as occasion arises.

§ 3. SYSTEM.

547. Two systems of classification used to be recognized in botany, — the artificial and the natural; but only the latter is now thought to deserve the name of a system.

548. Artificial classifications have for object merely the ascertaining of the name and place of a plant. They do not attempt to express relationships, but serve as a kind of dictionary. They distribute the genera and species according to some one peculiarity or set of peculiarities (just as a dictionary distributes words according to their first letters), disregarding all other considerations. At present an artificial classification in botany is needed only as a key to the natural orders, — as an aid in referring an unknown plant to its proper family; and such keys are still very needful, at least for the beginner. Formerly, when the orders themselves were not clearly made out, an artificial classification was required to lead the

student down to the genus. Two such classifications were long in vogue: First, that of Tournefort, founded mainly on the leaves of the flower, the calyx and corolla: this was the prevalent system throughout the first half of the eighteenth century; but it has long since gone by. It was succeeded by the well-known

549. **Artificial System of Linnæus**, which was founded on the stamens and pistils. It consists of twenty-four classes, and of a variable number of orders; the classes founded mainly on the number and disposition of the stamens; the orders partly upon the number of styles or stigmas, partly upon other considerations. Useful and popular as this system was down to a time within the memory of still surviving botanists, it is now completely obsolete. But the tradition of it survives in the names of its classes, Monandria, Diandria, Triandria, etc., which are familiar in terminology in the adjective terms monandrous, diandrous, triandrous, etc. (284); also of the orders, Monogynia, Digynia, Trigynia, etc., preserved in the form of monogynous, digynous, trigynous, etc. (301); and in the name Cryptogamia, that of the 24th class, which is continued for the lower series in the natural classification.

550. **Natural System.** A genuine system of botany consists of the orders or families, duly arranged under their classes, and having the tribes, the genera, and the species arranged in them according to their relationships. This, when properly carried out, is the *Natural System;* because it is intended to express, as well as possible, the various degrees of relationship among plants, as presented in nature; that is, to rank those species and those genera, etc., next to each other in the classification which are really most alike in all respects, or, in other words, which are constructed most nearly on the same particular plan.

551. There can be only *one* natural system of botany, if by this term is meant the plan according to which the vegetable creation was called into being, with all its grades and diversities among the species, as well of past as of the present time. But there may be many natural systems, if we mean the attempts of men to interpret and express that plan, — systems which will vary with advancing knowledge, and with the judgment and skill of different botanists. These must all be very imperfect, bear the impress of individual minds, and be shaped by the current philosophy of the age. But the endeavor always is to make the classification answer to Nature, as far as any system can which has to be expressed in a definite and serial arrangement.

552. So, although the classes, orders, genera, etc., are natural, or as natural as the systematist can make them, their grouping or order of arrangement in a book, must necessarily be in great measure artificial. Indeed, it is quite impossible to arrange the orders, or even the few classes, in a single series, and yet have each group stand next to its nearest relatives on both sides.

553. Especially it should be understood that, although phanerogamous

plants are of higher grade than cryptogamous, and angiospermous or ordinary phanerogamous higher than the gymnospermous, yet there is no culmination in the vegetable kingdom, nor any highest or lowest order of phanerogamous plants.

554. The particular system most largely used at present in the classification of the orders is essentially the following: —

SERIES I. PHANEROGAMIA: PHANEROGAMOUS OR FLOWERING PLANTS.

CLASS I. DICOTYLEDONES ANGIOSPERMEÆ, called for shortness in English, DICOTYLEDONS or DICOTYLS. Ovules in a closed ovary. Embryo dicotyledonous. Stem with exogenous plan of growth. Leaves reticulate-veined,

Artificial Division I. POLYPETALÆ, with petals mostly present and distinct. Orders about 80 in number, *Ranunculaceæ* to *Cornaceæ*.

Artificial Division II. GAMOPETALÆ, with gamopetalous corolla. Orders about 45, *Caprifoliaceæ* to *Plantaginaceæ*.

Artificial Division III. APETALÆ or INCOMPLETÆ, with perianth, when present, of calyx only. Orders about 35 in number, from *Nyctaginaceæ* to *Salicaceæ*.

CLASS II. DICOTYLEDONES GYMNOSPERMEÆ, in English GYMNOSPERMS. No ovary or pericarp, but ovules and seeds naked, and no proper calyx nor corolla. Embryo dicotyledonous or polycotyledonous. Stem with exogenous plan of growth. Leaves mostly parallel-veined. Consists of order *Gnetaceæ*, which strictly connects with Angiospermous Dicotyls, of *Coniferæ*, and of *Cycadaceæ*.

CLASS III. MONOCOTYLEDONES, in English MONOCOTYLEDONS or MONOCOTYLS. Angiospermous. Embryo monocotyledonous. Stem with endogenous plan of growth. Leaves mostly parallel-veined.

Division I. PETALOIDEÆ. Perianth complete, having the equivalent of both calyx and corolla, and all the inner series corolline. About 18 orders.

Division II. CALYCINÆ. Perianth complete (in two series) but not corolline, mostly thickish or glumaceous. Chiefly two orders, *Juncaceæ*, the true Rushes, and *Palmæ*, Palms.

Division III. SPADICIFLORÆ or NUDIFLORÆ. Perianth none, or rudimentary and incomplete: inflorescence spadiceous. Of five orders, *Typhaceæ* and *Aroideæ* the principal.

Division IV. GLUMACEÆ. Perianth none, or very rudimentary: glumaceous bracts to the flowers. Orders mainly *Cyperaceæ* and *Gramineæ*.

SERIES II. CRYPTOGAMIA: CRYPTOGAMOUS OR FLOWERLESS PLANTS.

CLASS I. PTERIDOPHYTA, PTERIDOPHYTES (484).

CLASS II. BRYOPHYTA, BRYOPHYTES (498).

CLASS III. THALLOPHYTA, THALLOPHYTES (503).

Section XIX. BOTANICAL WORK.

555. Some hints and brief instructions for the collection, examination, and preservation of specimens are added. They are especially intended for the assistance of those who have not the advantage of a teacher. They apply to phanerogamous plants and Ferns only, and to systematic botany.[1]

§ 1. COLLECTION, OR HERBORIZATION.

556. As much as possible, plants should be examined in the living state, or when freshly gathered. But dried specimens should be prepared for more leisurely examination and for comparison. To the working botanist good dried specimens are indispensable.

557. **Botanical Specimens,** to be complete, should have root or root-stock, stem, leaves, flowers, both open and in bud, and fruit. Sometimes these may all be obtained at one gathering; more commonly two or three gatherings at different times are requisite, especially for trees and shrubs.

558. **In Herborizing,** a good knife and a narrow and strong trowel are needed; but a very strong knife will serve instead of a trowel or small pick for digging out bulbs, tubers, and the like. To carry the specimens, either the tin box (*vasculum*) or a portfolio, or both are required. The tin box is best for the collection of specimens to be used fresh, as in the class-room; also for very thick or fleshy plants. The portfolio is indispensable for long expeditions, and is best for specimens which are to be preserved in the herbarium.

559. The *Vasculum*, or *Botanical Collecting-box*, is made of tin, in shape like a candle-box, only flatter, or the smaller sizes like an English sandwich-case; the lid opening for nearly the whole length of one side of the box. Any portable tin box of convenient size, and capable of holding specimens a foot or fifteen inches long, will answer the purpose. The box should shut close, so that the specimens may not wilt: then it will keep leafy branches and most flowers perfectly fresh for a day or two, especially if slightly moistened. They should not be wet.

560. *The Portfolio* is best made of two pieces of solid binder's-board, covered with enamel cloth, which also forms the back, and fastened by straps and buckles. It may be from a foot to twenty inches long, from nine to eleven or twelve inches wide. It should contain a needful quantity of smooth but strong and pliable paper (thin so-called Manilla paper is best), either fastened at the back as in a book, or loose in folded sheets when not very many specimens are required. As soon as gathered, the specimens should be separately laid between the leaves or in the folded sheets, and kept under moderate pressure in the closed portfolio.

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[1] For fuller directions in many particulars, see "Structural Botany," pp. 370-374.

561. Of small herbs, especially annuals, the whole plant, root and all, should be taken for a specimen. Of larger ones branches will suffice, with some leaves from near the root. Enough of the root or subterranean part of the plant should be collected to show whether it is an annual, a biennial, or a perennial. Thick roots, bulbs, tubers, or branches of specimens intended to be pressed should be thinned with a knife, or cut into slices. Keep the specimens within the length of fifteen or sixteen inches, by folding, or when that cannot be done, by cutting into lengths.

562. **For Drying Specimens** a good supply of soft and unsized paper is wanted; and some convenient means of applying considerable pressure. To make good dried botanical specimens, dry them as rapidly as possible between many thicknesses of sun-dried paper to absorb their moisture, under as much pressure as can be given without crushing the more delicate parts. This pressure may be had by a botanical press, of which various forms have been contrived; or by weights placed upon a board, — from forty to eighty or a hundred pounds, according to the quantity of specimens drying at the time. For use while travelling, a good portable press may be made of thick binders' boards for the sides, and the pressure may be applied by strong straps with buckles. Still better, on some accounts, are portable presses made of wire network, which allow the dampness to escape by evaporation between the meshes. For herborization in a small way, a light wire-press may be taken into the field and made to serve also as a portfolio.

563. It is well to have two kinds of paper, namely, *driers* of bibulous paper, stitched into pads (or the pads may be of thick carpet-paper, cut to size) and thin smooth paper, folded once; the specimens to be laid into the fold, either when gathered or on returning from the excursion. These sheets are to hold the specimens until they are quite dry. Every day, or at first even twice a day, the specimens, left undisturbed in their sheets, are to be shifted into fire-dried or sun-dried fresh driers, and the pressure renewed, while the moist sheets are spread out to dry, so as to take their turn again at the next shifting. This course must be continued until the specimens are no longer moist to the touch. Good and comely specimens are either made or spoiled within the first twenty-four or thirty-six hours. After that, when plenty of driers are used, it may not be necessary to change them so frequently.

564. Succulent plants, which long refuse to part with life and moisture, and Spruces and some other evergreens which are apt to cast off their leaves, may be plunged for a moment into boiling water, all but the flowers. Delicate flowers may be encased in thin tissue paper when put into the press. Thick parts, like the heads of Sun-flowers and Thistles, may be cut in two or into slices.

565. Dried specimens may be packed in bundles, either in folded paper or upon single half-sheets. It is better that such paper should not be bibulous. The packages should be well wrapped or kept in close cases.

566. **Poisoning** is necessary if specimens are to be permanently preserved from the depredation of insects. The usual application is an almost saturated solution of corrosive sublimate in 95 per cent alcohol, freely applied with a large and soft brush, or the specimens dipped into some of the solution poured into a large and flat dish; the wetted specimens to be transferred for a short time to driers.

§ 2. HERBARIUM.

567. The botanist's collection of dried specimens, ticketed with their names, place, and time of collection, and systematically arranged under their genera, orders, etc., forms a *Hortus Siccus* or *Herbarium*. It comprises not only the specimens which the proprietor has himself collected, but those which he acquires through friendly exchanges, or in other ways. The specimens of an herbarium may be kept in folded sheets of paper; or they may be fastened on half-sheets of thick and white paper, either by gummed slips, or by glue applied to the specimens themselves. The former is best for private and small herbaria; the latter for large ones which are much turned over. Each sheet should be appropriated to one species; two or more different plants should never be attached to the same sheet. The generic and specific name of the plant should be added to the lower right-hand corner, either written on the sheet, or on a ticket pasted down; and the time of collection, the locality, the color of the flowers, and any other information which the specimens themselves do not afford, should be duly recorded upon the sheet or the ticket. The sheets of the herbarium should all be of exactly the same dimensions. The herbarium of Linnæus is on paper of the common foolscap size, about eleven inches long and seven wide. This is too small. Sixteen and three eighths inches by eleven and a half inches is an approved size.

568. The sheets containing the species of each genus are to be placed in *genus-covers*, made of a full sheet of thick paper (such as the strongest Manilla-hemp paper), to be when folded of the same dimensions as the species-sheet but slightly wider: the name of the genus is to be written on one of the lower corners. These are to be arranged under the orders to which they belong, and the whole kept in closed cases or cabinets, either laid flat in compartments, like "pigeon-holes," or else placed in thick portfolios, arranged like folio volumes. All should be kept, as much as practicable, in dust-proof and insect-proof cases or boxes.

569. Fruits, tubers, and other hard parts, too thick for the herbarium, may be kept in pasteboard or light wooden boxes, in a collection apart. Small loose fruits, seeds, detached flowers, and the like may be conveniently preserved in paper capsules or envelopes, attached to the herbarium-sheets.

§ 3. INVESTIGATION AND DETERMINATION OF PLANTS.

570. **The Implements** required are a hand magnifying glass, a pocket lens of an inch or two focus, or a glass of two lenses, one of the lower and the other of the higher power; and a sharp penknife for dissection. With these and reasonable perseverance the structure of the flowers and fructification of most phanerogamous plants and Ferns can be made out. But for ease and comfort, as well as for certainty and right training, the student should have some kind of simple stage microscope, and under this make all dissections of small parts. Without it the student will be apt to fall into the bad habit of guessing where he ought to ascertain.

571. The simple microscope may be reduced to a good lens or doublet, of an inch focus, mounted over a glass stage, so that it can be moved up and down and also sidewise, and with (or without) a little mirror underneath. A better one would have one or two additional lenses (say of half and of a quarter inch focus), a pretty large stage, on the glass of which several small objects can be placed and conveniently brought under the lens; and its height or that of the lens should be adjustable by a rack-work; also a swivel-mounted little mirror beneath, which is needed for minute objects to be viewed by transmitted light.

572. For dissecting and displaying small parts on the stage of the microscope, besides a thin-bladed knife, the only tools needed are a good stock of common needles of various sizes, mounted in handles, and one or more saddler's-needles, which, being triangular, may be ground to sharp edges convenient for dissection. Also a pair of delicate-pointed forceps; those with curved points used by the dentist are most convenient. A cup of clean water is indispensable, with which to moisten or wet, or in which occasionally to float delicate parts. Small flowers, buds, fruits, and seeds of dried specimens can be dissected quite as well as fresh ones. They have only to be soaked in warm or boiling water.

573. The compound microscope is rarely necessary except in cryptogamic botany and vegetable anatomy; but it is very useful and convenient, especially for the examination of pollen. To the advanced botanist it is a necessity, to all students of botany an aid and delight.

574. **Analysis.** A few directions and hints may be given. The most important is this: In studying an unknown plant, make a complete examination of all its parts, and form a clear idea of its floral structure and that of its fruit, from pericarp down to the embryo, or as far as the materials in hand allow, before taking a step toward finding out its name and relationship by means of the keys or other helps which the Manuals and Floras provide. If it is the name merely that is wanted, the shorter way is to ask some one who already knows it. To verify the points of structure one by one as they happen to occur in an artificial key, without any preparatory investigation, is a usual but is not the best nor the surest

way. It is well to make drawings or outline sketches of the smaller parts, and especially diagrams of the plan of the flower, such as those of Fig. 225, 227, 241, 244, 275–277. For these, cross sections of the flower-bud or flower are to be made: and longitudinal sections, such as Fig. 270–274, are equally important. The dissection even of small seeds is not difficult after some practice. Commonly they need to be soaked or boiled.

575. The right appreciation of characters and terms used in description needs practice and calls for judgment. Plants do not grow exactly by rule and plummet, and measurements must be taken loosely. Difference of soil and situation are responded to by considerable variations, and other divergences occur which cannot be accounted for by the surroundings, nor be anticipated in general descriptions. Annuals may be very depauperate in dry soils or seasons, or very large when particularly well nourished. Warm and arid situations promote, and wet ones are apt to diminish pubescence. Salt water causes increased succulence. The color of flowers is apt to be lighter in shade, and brighter in open and elevated situations. A color or hue not normal to the species now and then occurs, which nothing in the conditions will account for. *A white-flowered variation of any other colored blossom may always be expected;* this, though it may be notable, no more indicates a distinct variety of the species than an albino would a variety of the human species. The numerical plan is subject to variation in some flowers; those on the plan of five may now and then vary to four or to six. Variations of the outline or lobing of leaves are so familiar that they do not much mislead. Only wider and longer observation suffices to prevent or correct mistakes in botanical study. But the weighing of evidence and the balancing of probabilities, no less than the use of the well-ordered and logical system of classification, give as excellent training to the judgment as the search for the facts themselves does to the observing powers.

§ 4. SIGNS AND ABBREVIATIONS.

576. For a full account of these, whether of former or actual use, see "Structural Botany" of the "Botanical Text Book," pp. 367, 392, as also for the principles which govern the accentuation of names. It is needful here to explain only those used in the Manuals and Floras of this country, for which the present volume is an introduction and companion. They are not numerous.

577. In arranging the species, at least those of a large genus, the divisions are denoted and graduated as follows: The sign § is prefixed to sections of the highest rank: these sections when they have names affixed to them (as PRUNUS § CERASUS) may be called subgenera. When the divisions of a genus are not of such importance, or when divisions are made under the subgenus itself, the most comprehensive ones are marked by asterisks, * for the first, * * for the second, and so on. Subdivisions are

marked with a prefixed +; those under this head with ++; and those under this with =, if there be so many grades. A similar notation is followed in the synopsis of the genera of an order.

578. The interrogation point is used in botany to indicate doubt. Thus *Clematis crispa,* L.? expresses a doubt whether the plant in question is really the *Clematis crispa* of Linnæus. *Clematis? polypetala* expresses a doubt whether the plant so named is really a Clematis. On the other hand the exclamation point (!) is used to denote certainty whenever there is special need to affirm this.

579. For size or height, the common signs of degrees, minutes, and seconds, have been used, thus, 1°, 2′, 3″, stand respectively for a foot, two inches, and three lines or twelfths of an inch. A better way, when such brevity is needed, is to write $1^{ft.}$. $2^{in.}$. $3^{l.}$

580. Signs for duration used by Linnæus were ☉ for an annual, ♂ for a biennial, ♃ for a perennial herb, ♄ for a shrub or tree. DeCandolle brought in ☉ for a plant that died after once flowering, ① if annual, ② if biennial.

581. To indicate sexes, ♂ means staminate or male plant or blossom; ♀, pistillate or female; ☿, perfect or hermaphrodite.

582. To save room it is not uncommon to use ∞ in place of "many;" thus, "Stamens ∞," for stamens indefinitely numerous: "∞ flora" for pluriflora or many-flowered. Still more common is the form "Stamens 5–20," or "Calyx 4–5-parted," for stamens from five to twenty, calyx four-parted or five-parted, and the like. Such abbreviations hardly need explanation.

583. The same may be said of such abbreviations as *Cal.* for calyx, *Cor.* for corolla, *Pet.* for petals, *St.* for stamens, *Pist.* for pistil, *Hab.* for habitat, meaning place of growth, *Herb.* for herbarium, *Hort.* for garden. Also *l. c.*, loco citato, which avoids repetition of volume and page.

584. "Structural Botany" has six pages of abbreviations of the names of botanists, mostly of botanical authors. As they are not of much consequence to the beginner, while the more advanced botanist will know the names in full, or know where to find them, only a selection is here appended.

ABBREVIATIONS OF THE NAMES OF BOTANISTS.

Adans. = Adanson.
Ait. Aiton.
All. Allioni.
Andr. Andrews.
Arn. Arnott.
Aub. Aublet.
Bartr. Bartram.
Beauv. Palisot de Beauvois.
Benth. Bentham.
Bernh. Bernhardi.
Bigel. Jacob Bigelow.
Bong. Bongard.
Bonpl. Bonpland.
Br. or *R. Br.* Robert Brown.
Cass. Cassini.
Cav. Cavanilles.
Cham. Chamisso.
Chapm. Chapman.
Chois. Choisy.
Clayt. Clayton.
Curt. Curtis.
Curt. (*M. A.*) M. A. Curtis.
Darl. Darlington.
DC., *DeCand.* } DeCandolle.
A. DC. Alphonse DeCandolle.
Desc. Descourtilz.
Desf. Desfontaines.
Desv. Desvaux.
Dill. Dillenius.
Dougl. Douglas.
Duham. Duhamel.
Dun. Dunal.
Eat. Eaton (Amos) or D. C.
Ehrh. Ehrhart.
Ell. Elliott.
Endl. Endlicher.
Engelm. Engelmann.
Engl. Engler.
Fisch. Fischer.
Frœl. Frœlich.
Gærtn. Gærtner.
Gaud. Gaudin.
Gaudich. Gaudichaud.
Ging. Gingins.
Gmel. = Gmelin.
Good. Goodenough.
Grev. Greville.
Griseb. Grisebach.
Gron., *Gronov.* } Gronovius.
Hall. Haller.
Hartm. Hartmann.
Hartw. Hartweg.
Harv. Harvey.
Haw. Haworth.
Hegelm. Hegelmaier.
Hemsl. Hemsley.
Herb. Herbert.
Hoffm. Hoffmann.
Hoffmans. Hoffmansegg.
Hook. Hooker.
Hook. f. J. D. Hooker.
Hornem. Hornemann.
Huds. Hudson.
Humb. Humboldt. [Kunth.
HBK. Humboldt, Bonpland, and
Jacq. Jacquin.
Jacq. f. J. F. Jacquin.
Juss. Jussieu.
A. Juss. Adrien de Jussieu.
Kit. Kitaibel.
L. or *Linn.* Linnæus.
Labill. Labillardiere.
Lag. Lagasca.
Lam. Lamarck.
Ledeb. Ledebour.
Lehm. Lehmann.
Lesq. Lesquereux.
Less. Lessing.
Lestib. Lestibudois.
L'Her. L'Heritier.
Lindb. Lindberg.
Lindh. Lindheimer.
Lindl. Lindley.
Lodd. Loddiges.
Loud. Loudon.
M. Bieb. Marschall von Bieberstein.
Marsh. Marshall (Humphrey).
Mart. Martius.

Mast. = Masters.
Maxim. Maximowicz.
Meisn. } Meisner or
Meissn. } Meissner.
Michx. or *Mx.* Michaux.
Michx. f. F. A. Michaux.
Mill. Miller.
Miq. Miquel.
Mitch. Mitchell.
Moç. Moçino.
Moq. Moquin-Tandon.
Moric. Moricand.
Moris. Morison.
Muell. Arg. J. Mueller.
Muell. (*F.*) Ferdinand Mueller.
Muhl. Muhlenberg.
Murr. Murray.
Naud. Naudin.
Neck. Necker.
Nees } Nees von Esenbeck.
N. ab E. }
Nutt. Nuttall.
Œd. Œder.
Ort. Ortega.
P. de Beauv. Palisot de Beauvois.
Pall. Pallas.
Parl. Parlatore.
Pav. Pavon.
Pers. Persoon.
Planch. Planchon.
Pluk. Plukenet.
Plum. Plumier.
Poir. Poiret.
Radlk. Radlkofer.
Raf. Rafinesque.
Red. Redouté.
Reichenb. Reichenbach.
Rich. L. C. Richard.
Rich. f. or *A.* Achille Richard.
Richards. Richardson.
Ridd. Riddell.
Rœm. & Schult. = Rœmer & Schultes.
Rottb. Rottbœll.
Rupr. Ruprecht.
St. Hil. Saint-Hilaire.
Salisb. Salisbury.
Schk. Schkuhr.
Schlecht. Schlechtendal.
Schrad. Schrader.
Schreb. Schreber.
Schwein. Schweinitz.
Scop. Scopoli.
Spreng. Sprengel.
Sternb. Sternberg.
Steud. Steudel.
Sull. Sullivant.
Thunb. Thunberg.
Torr. Torrey.
Tourn. Tournefort.
Trautv. Trautvetter.
Trin. Trinius.
Tuck. Tuckerman.
Vaill. Vaillant.
Vent. Ventenat.
Vill. Villars.
Wahl. Wahlenberg.
Walds. Waldstein.
Wall. Wallich.
Wallr. Wallroth.
Walp. Walpers.
Walt. Walter.
Wang. Wangenheim.
Wats. Sereno Watson, unless other initials are given.
Wedd. Weddell.
Wendl. Wendland.
Wiks. Wikstrom.
Willd. Willdenow.
Wulf. Wulfen.
Zucc. Zuccarini.
Zuccag. Zuccagini.

GLOSSARY AND INDEX,

OR

DICTIONARY OF THE PRINCIPAL TERMS IN DESCRIPTIVE BOTANY, COMBINED WITH AN INDEX.

For the convenience of unclassical students, the commoner Latin and Greek words (or their equivalents in English form) which enter into the composition of botanical names, as well as of technical terms, are added to this Glossary. The numbers refer to pages.

A, at the beginning of words of Greek derivation, commonly signifies a negative, or the absence of something; as *a*petalous, without petals; *a*phyllous, leafless, &c. In words beginning with a vowel, the prefix is *an;* as *an*antherous, destitute of anther.

Abnormal, contrary to the usual or the natural structure.

Aboriginal, original in the strictest sense; same as indigenous.

Abortive, imperfectly formed, or rudimentary.

Abortion, the imperfect formation or the non-formation of some part.

Abrupt, suddenly terminating; as, for instance,

Abruptly pinnate, pinnate without an odd leaflet at the end, 58.

Acantho-, spiny.

Acaulescent (acaulis), apparently stemless; the proper stem, bearing the leaves and flowers, being very short or subterranean.

Accessory, something additional; as *Accessory buds*, 30, 31; *Accessory fruits*, 118.

Accrescent, growing larger after flowering.

Accrete, grown to.

Accumbent, lying against a thing. The cotyledons are accumbent when they lie with their edges against the radicle, 128.

Acephalous, headless.

Acerose, needle-shaped, as the leaves of Pines.

Acetabuliform, saucer-shaped.

Achœnium, or *Achenium* (plural *achenia*), a one-seeded, seed-like fruit, 120.

Achlamydeous (flower), without floral envelopes, 86.

Acicular, needle-shaped; more slender than acerose.

Acinaciform, scimitar-shaped, like some bean-pods.

Acines, the separate grains of a fruit, such as the raspberry.

Acorn, the nut of the Oak, 122.

Acotyledonous, destitute of cotyledons or seed-leaves.

Acrogenous, growing from the apex, as the stems of Ferns and Mosses. *Acrogens*, or *Acrogenous Plants*, a name for the vascular cryptogamous plants, 156.

Aculeate, armed with prickles, i. e. *aculei;* as the Rose and Brier.

Aculeolate, armed with small prickles, or slightly prickly.

Acuminate, taper-pointed, 54.

Acute, merely sharp-pointed, or ending in a point less than a right angle, 54.

Adelphous (stamens), joined in a fraternity (*adelphia*); see *monadelphous*, &c.
Aden, Greek for gland. So *Adenophorous*, gland-bearing.
Adherent, sticking to, or more commonly, growing fast to another body.
Adnate, literally, growing fast to, born adherent, 95. The anther is adnate when fixed by its whole length to the filament or its prolongation, 101.
Adnation, the state of being adnate, 94.
Adpressed or *appressed*, brought into contact with, but not united.
Adscendent, *ascendent*, or *ascending*, rising gradually upwards, 39.
Adsurgent, or *assurgent*, same as ascending, 39.
Adventitious, out of the proper or usual place; e. g. *Adventitious buds*, 30.
Adventive, applied to foreign plants accidentally or sparingly introduced into a country, but hardly to be called naturalized.
Æquilateral, equal-sided; opposed to oblique.
Aerial roots, &c., 36.
Æruginous, verdigris-colored.
Æstival, produced in summer.
Æstivation, the arrangement of parts in a flower-bud, 97.
Agamous, sexless.
Aggregate fruits, 118.
Agrestis, growing in fields.
Air-cells or *Air-passages*, spaces in the tissue of leaves and some stems, 131.
Air-Plants, 36.
Akene or *Akenium*, 120.
Ala (plural, *alæ*), a wing; the side-petals of a papilionaceous corolla, 92.
Alabastrum, a flower-bud.
Alar, situated in the forks of a stem.
Alate, winged.
Albescent, whitish, or turning white.
Albus, Latin for white.
Albumen of the seed, nourishing matter stored up with the embryo, 21, 127.
Albumen, a vegetable product, of four elements.
Albuminous (seeds), furnished with albumen, 21.
Alburnum, young wood, sap-wood, 142.
Alliaceous, with odor of garlic.
Allogamous, close fertilization.
Alpestrine, subalpine.
Alpine, belonging to high mountains above the limit of forests.
Alternate (leaves), one after another, 29, 67. Petals are *alternate* with the sepals, or stamens with the petals, when they stand over the intervals between them, 82.
Alveolate, honeycomb-like.
Ament, the scaly spike of trees like the Birch and Willow, 75.
Amentaceous, catkin-like, or catkin-bearing.
Amorphous, shapeless, without any definite form.
Amphicarpous, producing two kinds of fruit.
Amphigastrium (plural, *amphigastria*), a peculiar stipule-like leaf of Liverworts.
Amphitropous, ovules or seeds, 111.
Amphora, a pitcher-shaped organ.
Amplectant, embracing. *Amplexicaul* (leaves), clasping the stem by the base.
Ampullaceous, swelling out like a bottle or bladder (*ampulla*).
Amylaceous, *Amyloid*, composed of starch (*amylum*), or starch-like.
Anandrous, without stamens.
Anantherous, without anthers. *Ananthous*, destitute of flowers; flowerless.
Anastomosing, forming a net-work (*anastomosis*), as the veins of leaves, 50.
Anatropous ovules or seeds, 111.
Ancipital (*anceps*), two-edged.
Andrœcium, a name for the stamens taken together, 98.

Andro-diœcious, flowers staminate on one plant, perfect on another.
Androgynous, having both staminate and pistillate flowers in the same cluster.
Androphore, a column of united stamens, as in a Mallow.
Androus, or *Ander*, *andra*, *andrum*, Greek in compounds for male, or stamens.
Anemophilous, wind-loving, said of wind-fertilizable flowers, 113.
Anfractuose, bent hither and thither as the anthers of the Squash, &c.
Angiospermæ, *Angiospermous*, with seeds formed in an ovary or pericarp, 109.
Angular divergence of leaves, 69.
Anisos, unequal. *Anisomerous*, parts unequal in number. *Anisopetalous*, with unequal petals. *Anisophyllous*, the leaves unequal in the pairs.
Annual (plant), flowering and fruiting the year it is raised from the seed, and then dying, 37.
Annular, in the form of a ring, or forming a circle.
Annulate, marked by rings; or furnished with an
Annulus, or ring, like that of the spore-case of most Ferns. In Mosses it is a ring of cells placed between the mouth of the spore-case and the lid in many species.
Annotinous, yearly, or in yearly growths.
Anterior, in the blossom, is the part next the bract, i. e. external; while the posterior side is that next the axis of inflorescence. Thus, in the Pea, &c., the keel is *anterior*, and the standard *posterior*, 96.
Anthela, an open paniculate cyme.
Anther, the essential part of the stamen, which contains the pollen, 14, 80, 101.
Antheridium (plural *antheridia*), the organ in Cryptogams which answers to the anther of Flowering Plants, 150.
Antheriferous, anther-bearing.
Anthesis, the period or the act of the expansion of a flower.
Anthocarpus (fruits), 118.
Anthophore, a stipe between calyx and corolla, 113.
Anthos, Greek for flower; in composition, *Monanthous*, one-flowered, &c
Anticous, same as anterior.
Antrorse, directed upwards or forwards.
Apetalous, destitute of petals, 86.
Aphyllous, leafless.
Apical, belonging to the apex or point.
Apiculate, pointleted; tipped with a small point.
Apocarpous (pistils), when the several pistils of the same flower are separate.
Apophysis, any irregular swelling; the enlargement at the base of the spore-case of the Umbrella-Moss.
Apothecium, the fructification of Lichens, 171.
Appendage, any superadded part. *Appendiculate*, provided with appendages.
Appressed, close pressed to the stem, &c.
Apricus, growing in dry and sunny places.
Apterous, wingless.
Aquatic (*Aquatilis*), living or growing in water; applied to plants whether growing under water, or with all but the base raised out of it.
Arachnoid, *Araneose*, cobwebby; clothed with, or consisting of, soft downy fibres.
Arboreous, *Arborescent*, tree-like, in size or form, 39.
Arboretum, a collection of trees.
Archegonium (plural *archegonia*), the organ in Mosses, &c., which is analogous to the pistil of Flowering Plants.
Arcuate, bent or curved like a bow.
Arenose (*Arenarius*), growing in sand.
Areolate, marked out into little spaces or *areolæ*.
Argenteous, or *Argentate*, silvery-like.
Argillose, growing in clay.
Argos, Greek for pure white; *Argophyllous* or *Argyrophyllous*, white-leaved, &c.
Argutus, acutely dentate.

Arillate (seeds) furnished with an aril.
Arilliform, aril-like.
Arillus, or *Aril*, a fleshy growth from base of a seed, 126.
Aristate, awned, i. e. furnished with an *arista*, like the beard of Barley, &c., 54.
Aristulate, diminutive of the last; short-awned.
Arrect, brought into upright position.
Arrow-shaped or *Arrow-headed*, same as *sagittate*, 53.
Articulated, jointed; furnished with joints or *articulations*, where it separates or inclines to do so. *Articulated leaves*, 57.
Artificial Classification, 181.
Ascending (stems, &c.), 39; (seeds or ovules) 110.
Ascidium, a pitcher-shaped body, like leaves of Sarracenia.
Ascus (*asci*), a sac, the spore-case of Lichens and some Fungi.
Aspergilliform, shaped like the brush used to sprinkle holy water; as the stigmas of many Grasses.
Asperous, rough to touch.
Assimilation, 144, 147.
Assurgent, same as ascending, 39.
Atropous or *Atropal* (ovules), same as orthotropous.
Aurantiacous, orange-colored.
Aureous, golden.
Auriculate, furnished with *auricles* or ear-like appendages, 53.
Autogamy, self-fertilization, 115.
Awl-shaped, sharp-pointed from a broader base, 61.
Awn, the bristle or beard of Barley, Oats, &c.; or any similar appendage.
Awned or *Awn-pointed*, furnished with an awn or long bristle-shaped tip, 54.
Axil, the angle on the upper side between a leaf and the stem, 13.
Axile, belonging to the axis, or occupying the axis.
Axillary (buds, &c.), occurring in an axil, 27.
Axis, the central line of any body; the organ round which others are attached; the root and stem. *Ascending* and *Descending Axis*, 38.

Baccate, berried, berry-like, of a pulpy-nature like a berry (*bacca*).
Badius, chestnut-colored.
Banner, see Standard, 92.
Barbate, bearded; bearing tufts, spots, or lines of hairs.
Barbed, furnished with a *barb* or double hook; as the apex of the bristle on the fruit of Echinospermum (Stickseed), &c.
Barbellate, said of the bristles of the pappus of some Compositæ when beset with short, stiff hairs, longer than when denticulate, but shorter than when plumose.
Barbellulate, diminutive of barbellate.
Bark, the covering of a stem outside of the wood, 138, 140.
Basal, belonging or attached to the
Base, that extremity of any organ by which it is attached to its support.
Basifixed, attached by its base.
Bast, *Bast-fibres*, 134.
Beaked, ending in a prolonged narrow tip.
Bearded, see *barbate*. *Beard* is sometimes used for awn, more commonly for long or stiff hairs of any sort.
Bell-shaped, of the shape of a bell, as the corolla of Harebell, 90.
Berry, a fruit pulpy or juicy throughout, as a grape, 119.
Bi- (or *Bis*), in compound words, twice; as
Biarticulate, twice-jointed, or two-jointed; separating into two pieces.
Biauriculate, having two ears, as the leaf in fig. 126.
Bicallose, having two callosities or harder spots.
Bicarinate, two-keeled.
Bicipital (*Biceps*), two-headed; dividing into two parts.

Biconjugate, twice paired, as when a petiole forks twice.
Bidentate, having two teeth (not twice or doubly dentate).
Biennial, of two years' continuance; springing from the seed one season, flowering and dying the next, 38.
Bifarious, two-ranked; arranged in two rows.
Bifid, two-cleft to about the middle.
Bifoliolate, a compound leaf of two leaflets, 59.
Bifurcate, twice forked; or more commonly, forked into two branches.
Bijugate, bearing two pairs (of leaflets, &c.).
Bilabiate, two-lipped, as the corolla of Labiatæ.
Bilamellate, of two plates (*lamellæ*), as the stigma of Mimulus.
Bilobed, the same as two-lobed.
Bilocellate, when a cell is divided into two *locelli*.
Bilocular, two-celled; as most anthers, the pod of Foxglove, &c.
Binary, in twos.
Binate, in couples, two together. *Bipartite*, the Latin form of two-parted.
Binodal, of two nodes.
Binomial, of two words, as the name of genus and species taken together, 180.
Bipalmate, twice palmately divided.
Biparous, bearing two.
Bipinnate (leaf), twice pinnate, 58. *Bipinnatifid*, twice pinnatifid, 57.
Bipinnatisect, twice pinnately divided.
Biplicate, twice folded together.
Biserial, or *Biseriate*, occupying two rows, one within the other.
Biserrate, doubly serrate, as when the teeth of a leaf are themselves serrate.
Bisexual, having both stamens and pistil.
Biternate, twice ternate; i. e. principal divisions three, each bearing three leaflets, 59.
Bladdery, thin and inflated.
Blade of a leaf, its expanded portion, 49.
Bloom, the whitish powder on some fruits, leaves, &c.
Boat-shaped, concave within and keeled without, in shape like a small boat.
Border of corolla, &c., 89.
Brachiate, with opposite branches at right angles to each other.
Brachy-, short, as *Brachycarpous*, short-fruited, &c.
Bract (*Bractea*), the leaf of an inflorescence. Specially, the bract is the small leaf or scale from the axil of which a flower or its pedicel proceeds, 73.
Bracteate, furnished with bracts.
Bracteolate, furnished with bractlets.
Bracteose, with numerous or conspicuous bracts.
Bractlet (*Bracteola*), or *Bracteole*, is a bract seated *on* the pedicel or flower-stalk, 73.
Branch, *Branching*, 27.
Breathing-pores, 144.
Bristles, stiff, sharp hairs, or any very slender bodies of similar appearance.
Bristly, beset with bristles. *Bristle-pointed*, 54.
Brunneous, brown.
Brush-shaped, see *aspergilliform*.
Bryology, that part of botany which relates to Mosses.
Bryophyta, *Bryophytes*, 163.
Bud, a branch in its earliest or undeveloped state, 27. *Bud-scales*, 63.
Bulb, a leaf-bud with fleshy scales, usually subterranean, 46.
Bulbils, diminutive bulbs.
Bulbiferous, bearing or producing bulbs. *Bulbose* or *bulbous*, bulb-like in shape, &c.
Bulblets, small bulbs, borne above ground, 46.
Bulb-scales, 46.
Bullate, appearing as if blistered or bladdery (from *bulla*, a bubble).
Byssaceous, composed of fine flax-like threads.

Caducous, dropping off very early, compared with other parts; as the calyx in the Poppy, falling when the flower opens.
Cæruleous, blue. *Cærulescent*, becoming bluish.
Cæspitose, or *Cespitose*, growing in turf-like patches or tufts.
Calathiform, cup-shaped.
Calcarate, furnished with a spur (*calcar*), 86, 87.
Calceolate or *Calceiform*, slipper-shaped, like one petal of the Lady's Slipper.
Callose, hardened; or furnished with callosities or thickened spots.
Calvous, bald or naked of hairs.
Calyciflorus, when petals and stamens are adnate to calyx.
Calycine, belonging to the calyx.
Calyculate, furnished with an outer accessory calyx (*calyculus*) or set of bracts looking like a calyx, as in true Pinks.
Calyptra, the hood or veil of the capsule of a Moss, 163.
Calyptrate, having a calyptra.
Calyptriform, shaped like a calyptra or candle-extinguisher.
Calyx, the outer set of the floral envelopes or leaves of the flower, 14, 79.
Cambium, *Cambium-layer*, 140.
Campanulate, bell-shaped, 90.
Campylotropous, or *Campylotropal*, curved ovules and seeds, 111. *Campylospermous*, applied to fruits of Umbelliferæ when the seed is curved in at the edges, forming a groove down the inner face; as in Sweet Cicely.
Canaliculate, channelled, or with a deep longitudinal groove.
Cancellate, latticed, resembling lattice-work.
Candidus, Latin for pure white.
Canescent, grayish-white; hoary, usually because the surface is covered with fine white hairs. *Incanous* is whiter still.
Canous, whitened with pubescence; see *incanous*.
Capillaceous, *Capillary*, hair-like in shape; as fine as hair or slender bristles.
Capitate, having a globular apex, like the head on a pin.
Capitellate, diminutive of capitate.
Capitulum, a close rounded dense cluster or *head* of sessile flowers, 74.
Capreolate, bearing tendrils (from *capreolus*, a tendril).
Capsule, a dry dehiscent seed-vessel of a compound pistil, 122.
Capsular, relating to, or like a capsule.
Capture of insects, 154.
Carina, a keel; the two anterior petals of a papilionaceous flower, 92.
Carinate, keeled, furnished with a sharp ridge or projection on the lower side.
Cariopsis, or *Caryopsis*, the one-seeded fruit or grain of Grasses, 121.
Carneous, flesh-colored; pale red. *Carnose*, fleshy in texture.
Carpel, or *Carpidium*, a simple pistil or a pistil-leaf, 106.
Carpellary, pertaining to a carpel.
Carpology, that department of botany which relates to fruits.
Carpophore, the stalk or support of a pistil extending between its carpels, 113.
Carpos, Greek for fruit.
Cartilaginous, or *Cartilagineous*, firm and tough in texture, like cartilage
Caruncle, an excrescence at the scar of some seeds, 126.
Carunculate, furnished with a caruncle.
Caryophyllaceous, pink-like: applied to a corolla of 5 long-clawed petals.
Cassideous, helmet-shaped.
Cassus, empty and sterile.
Catenate, or *Catenulate*, end to end as in a chain.
Catkin, see Ament, 75.
Caudate, tailed, or tail-pointed.
Caudex, a sort of trunk, such as that of Palms; an upright rootstock, 39, 44.
Caudicle, the stalk of a pollen-mass, &c.
Caulescent, having an obvious stem, 36.

Caulicle, a little stem, or rudimentary stem (of a seedling), 11, 127.
Cauline, of or belonging to a stem, 36. *Caulis*, Latin name of stem.
Caulocarpic, equivalent to perennial.
Caulome, the cauline parts of a plant.
Cell (diminutive, *Cellule*), the cavity of an anther, ovary, &c.; one of the anatomical elements, 131.
Cellular Cryptogams, 162. *Cellular tissue*, 131.
Cellulose, 131. *Cell-walls*, 130.
Centrifugal (inflorescence), produced or expanding in succession from the centre outwards, 77.
Centripetal, the opposite of centrifugal, 74.
Cephala, Greek for head. In compounds, *Monocephalous*, with one head, *Microcephalous*, small-headed, &c.
Cereal, belonging to corn, or corn-plants.
Cernuous, nodding; the summit more or less inclining.
Chæta, Greek for bristle.
Chaff, small membranous scales or bracts on the receptacle of Compositæ; the glumes, &c., of grasses.
Chaffy, furnished with chaff, or of the texture of chaff.
Chalaza, that part of the ovule where all the parts grow together, 110, 126.
Channelled, hollowed out like a gutter; same as *canaliculate*.
Character, a phrase expressing the essential marks of a species, genus, &c., 181.
Chartaceous, of the texture of paper or parchment.
Chloros, Greek for green, whence *Chloranthous*, green-flowered; *Chlorocarpous*, green-fruited, &c.
Chlorophyll, leaf green, 136.
Chlorosis, a condition in which naturally colored parts turn green.
Choripetalous, same as polypetalous.
Chorisis, separation of the normally united parts, or where two or more parts take the place of one.
Chromule, coloring matter in plants, especially when not green, or when liquid.
Chrysos, Greek for golden yellow, whence *Chrysanthous*, yellow-flowered, &c.
Cicatrix, the scar left by the fall of a leaf or other organ.
Ciliate, beset on the margin with a fringe of *cilia*, i. e. of hairs or bristles, like the eyelashes fringing the eyelids, whence the name.
Cinereous, or *Cineraceous*, ash-grayish; of the color of ashes.
Circinate, rolled inwards from the top, 72.
Circumscissile, or *Circumcissile*, divided by a circular line round the sides, as the pods of Purslane, Plantain, &c., 124.
Circumscription, general outline.
Cirrhiferous, or *Cirrhose*, furnished with a tendril (Latin, *Cirrhus*); as the Grape-vine. *Cirrhose* also means resembling or coiling like tendrils, as the leaf-stalks of Virgin's-bower. More properly *Cirrus* and *Cirrose*.
Citreous, lemon-yellow.
Clados, Greek for branch. *Cladophylla*, 64.
Class, 178, 183.
Classification, 175, 183.
Clathrate, latticed; same as *cancellate*.
Clavate, club-shaped; slender below and thickened upwards.
Clavellate, diminutive of clavate.
Claviculate, having *Claviculæ*, or little tendrils or hooks.
Claw, the narrow or stalk-like base of some petals, as of Pinks, 91.
Cleistogamous (*Cleistogamy*), fertilized in closed bud, 115.
Cleft, cut into lobes, 55.
Close fertilization, 115.
Climbing, rising by clinging to other objects, 39, 151.
Club-shaped, see *clavate*.
Clustered, leaves, flowers, &c., aggregated or collected into a bunch.

Clypeate, buckler-shaped.
Coadunate, same as *connate*, i. e. united.
Coalescent, growing together. *Coalescence*, 88.
Coarctate, contracted or brought close together.
Coated, having an integument, or covered in layers. Coated bulb, 46.
Cobwebby, same as *arachnoid*; bearing hairs like cobwebs or gossamer.
Coccineous, scarlet-red.
Coccus (plural *cocci*), anciently a berry; now mostly used to denote the separable carpels or nutlets of a dry fruit.
Cochleariform, spoon-shaped.
Cochleate, coiled or shaped like a snail-shell.
Cœlospermous, applied to those fruits of Umbelliferæ which have the seed hollowed on the inner face, by incurving of top and bottom; as in Coriander.
Coherent, usually the same as *connate*.
Cohort, name sometimes used for groups between order and class, 178.
Coleorhiza, a root-sheath.
Collateral, side by side.
Collective fruits, 118.
Collum or *Collar*, the neck or junction of stem and root.
Colored, parts of a plant which are other-colored than green.
Columella, the axis to which the carpels of a compound pistil are often attached, as in Geranium (112), or which is left when a pod opens, as in Azalea.
Column, the united stamens, as in Mallow, or the stamens and pistils united into one body, as in the Orchis family.
Columnar, shaped like a column or pillar.
Coma, a tuft of any sort (literally, a head of hair), 125.
Comose, tufted; bearing a tuft of hairs, as the seeds of Milkweed, 126.
Commissure, the line of junction of two carpels, as in the fruit of Umbelliferæ.
Complanate, flattened.
Compound leaf, 54, 57. *Compound pistil*, 107. *Compound umbel*, 75, &c.
Complete (flower), 81.
Complicate, folded upon itself.
Compressed, flattened on opposite sides.
Conceptacle, 168.
Concinnous, neat.
Concolor, all of one color.
Conchiform, shell- or half-shell- shaped.
Conduplicate, folded upon itself lengthwise, 71.
Cone, the fruit of the Pine family, 124. *Coniferous*, cone-bearing.
Confertus, much crowded.
Conferruminate, stuck together, as the cotyledons in a horse-chestnut.
Confluent, blended together; or the same as *coherent*.
Conformed, similar to another thing it is associated with or compared to; or closely fitted to it, as the skin to the kernel of a seed.
Congested, *Conglomerate*, crowded together.
Conglomerate, crowded into a glomerule.
Conjugate, coupled; in single pairs. *Conjugation*, 170.
Connate, united or grown together from the first formation, 96.
Connate-perfoliate, when a pair of leaves are connate round a stem, 60.
Connective, *Connectivum*, the part of the anther connecting its two cells, 101.
Connivent, converging, or brought close together.
Consolidation (floral), 94.
Consolidated forms of vegetation, 47.
Contents of cells, 136.
Continuous, the reverse of interrupted or articulated.
Contorted, twisted together. *Contorted æstivation*, same as *convolute*, 97.
Contortuplicate, twisted back upon itself.
Contracted, either narrowed or shortened.

Contrary, turned in opposite direction to the ordinary.
Convolute, rolled up lengthwise, as the leaves of the Plum in vernation, 72. In æstivation, same as *contorted*, 97.
Cordate, heart-shaped, 53.
Coriaceous, resembling leather in texture.
Corky, of the texture of cork. *Corky layer* of bark, 141.
Corm, a solid bulb, like that of Crocus, 45.
Corneous, of the consistence or appearance of horn.
Corniculate, furnished with a small horn or spur.
Cornute, horned; bearing a horn-like projection or appendage.
Corolla, the leaves of the flower within the calyx, 14, 79.
Corollaceous, *Corolline*, like or belonging to a corolla.
Corona, a coronet or crown; an appendage at the top of the claw of some petals, 91.
Coronate, crowned; furnished with a crown.
Cortex, bark. *Cortical*, belonging to the bark (*cortex*).
Corticate, coated with bark or bark-like covering.
Corymb, a flat or convex indeterminate flower-cluster, 74.
Corymbiferous, bearing corymbs.
Corymbose, in corymbs, approaching the form of a corymb, or branched in that way.
Costa, a rib; the midrib of a leaf, &c. *Costate*, ribbed.
Cotyledons, the proper leaves of the embryo, 11, 127.
Crateriform, goblet-shaped or deep saucer-shaped.
Creeping (stems), growing flat on or beneath the ground and rooting, 39.
Cremocarp, a half-fruit, or one of the two carpels of Umbelliferæ, 121.
Crenate, or *Crenelled*, the edge scalloped into rounded teeth, 55.
Crenulate, minutely or slightly crenate.
Crested, or *Cristate*, bearing any elevated appendage like a crest.
Cretaceous, chalky or chalk-like.
Cribrose, or *cribriform*, pierced like a sieve with small apertures.
Crinite, bearing long hairs.
Crispate, curled or crispy.
Croceous, saffron-color, deep reddish-yellow.
Cross-breeds, the progeny of interbred varieties, 176.
Cross fertilization, 115.
Crown, see *corona*. *Crowned*, see *coronate*.
Cruciate, or *Cruciform*, cross-shaped. *Cruciform Corolla*, 86.
Crustaceous, hard and brittle in texture; crust-like.
Cryptogamous Plants, *Cryptogams*, 10, 156.
Cryptos, concealed, as *Cryptopetalous*, with concealed petals, &c.
Crystals in plants, 137.
Cucullate, hooded, or hood-shaped, rolled up like a cornet of paper, or a hood (*cucullus*), as the spathe of Indian Turnip, 75.
Culm, a straw; the stem of Grasses and Sedges, 39.
Cultrate, shaped like a trowel or broad knife.
Cuneate, *Cuneiform*, wedge-shaped, 53.
Cup-shaped, same as cyathiform or near it.
Cupule, a little cup; the cup to the acorn of the Oak, 122.
Cupular, or *Cupulate*, provided with a cupule.
Cupuliferous, cupule-bearing.
Curviveined, with curved ribs or veins.
Curviserial, in oblique or spiral ranks.
Cushion, the enlargement at the insertion or base of a petiole.
Cuspidate, tipped with a sharp and stiff point or *cusp*, 54.
Cut, same as incised, or applied generally to any sharp and deep division, 55.
Cuticle, the skin of plants, or more strictly its external pellicle.
Cyaneous, bright blue.
Cyathiform, in the shape of a cup, or particularly of a wine-glass.
Cycle, one complete turn of a spire, or a circle, 70.

Cyclical, rolled up circularly, or coiled into a complete circle.
Cyclosis, circulation in closed cells, 149.
Cylindraceous, approaching to the *Cylindrical* form, terete and not tapering.
Cymbæform, or *Cymbiform*, same as boat-shaped.
Cyme, a cluster of centrifugal inflorescence, 77.
Cymose, furnished with cymes, or like a cyme.
Cymule, a partial or diminutive cyme, 77.

Deca- (in words of Greek derivation), ten; as
Decagynous, with 10 pistils or styles, *Decamerous*, of 10 parts, *Decandrous*, with 10 stamens, &c.
Deciduous, falling off, or subject to fall; said of leaves which fall in autumn, and of a calyx and corolla which fall before the fruit forms.
Declinate, *declined*, turned to one side, or downwards.
Decompound, several times compounded or divided, 59.
Decumbent, reclined on the ground, the summit tending to rise, 39.
Decurrent (leaves), prolonged on the stem beneath the insertion, as in Thistles.
Decussate, arranged in pairs which successively cross each other, 71.
Deduplication, same as chorisis.
Definite, when of a uniform number, and not above twelve or so.
Definite Inflorescence, 72.
Deflexed, bent downwards.
Deflorate, past the flowering state, as an anther after it has discharged its pollen.
Dehiscence, the regular splitting open of capsule or anther, 103, 119.
Dehiscent, opening by regular dehiscence, 119, 123.
Deliquescent, branching off so that the stem is lost in the branches, 32.
Deltoid, of a triangular shape, like the Greek capital Δ.
Demersed, growing below the surface of water.
Dendroid, *Dendritic*, tree-like in form or appearance.
Dendron, Greek for tree.
Deni, ten together.
Dens, Latin for tooth.
Dentate, toothed, 55. *Denticulate*, furnished with denticulations, or little teeth.
Depauperate, impoverished or starved, and so below the natural size.
Depressed, flattened or as if pressed down from above.
Derma, Greek for skin.
Descending, tending gradually downwards. *Descending axis*, the root.
Desmos, Greek for things connected or bound together.
Determinate Inflorescence, 72.
Dextrorse, turned to the right hand.
Di- Dis (in Greek compounds) two, as
Diadelphous (stamens), united by their filaments in two sets, 99.
Diagnosis, a short distinguishing character or descriptive phrase.
Dialypetalous, same as polypetalous.
Diandrous, having two stamens, &c.
Diaphanous, transparent or translucent.
Dicarpellary, of two carpels.
Dichlamydeous (flower), having both calyx and corolla.
Dichogamous, *Dichogamy*, 116.
Dichotomous, two-forked.
Diclinous, having the stamens in one flower, the pistils in another, 85.
Dicoccous (fruit), splitting into two *cocci* or closed carpels.
Dicotyls, 23.
Dicotyledonous (embryo), having a pair of cotyledons, 23. *Dicotyledonous Plants*, 23, 182.
Didymous, twin.
Didynamous (stamens), having four stamens in two pairs, 100.
Diffuse, spreading widely and irregularly.

Digitate (fingered), where the leaflets of a compound leaf are all borne on the apex of the petiole, 58.
Digynous (flower), having two pistils or styles, 105.
Dimerous, made up of two parts, or its organs in twos.
Dimidiate, halved; as where a leaf or leaflet has only one side developed.
Dimorphism, 117. *Dimorphous*, *Dimorphic*, of two forms, 117.
Diœcious, or *Dioicous*, with stamens and pistils on different plants, 85.
Dipetalous, of two petals. *Diphyllous*, two-leaved. *Dipterous*, two-winged.
Diplo-, Greek for double, as *Diplostemonous*, with two sets of stamens.
Disciform or *Disk-shaped*, flat and circular, like a disk or quoit.
Discoidal, or *Discoid*, belonging to or like a disk.
Discolor, of two different colors or hues.
Discrete, separate, opposite of concrete.
Disepalous, of two sepals.
Disk, the face of any flat body; the central part of a head of flowers, like the Sunflower, or Coreopsis, as opposed to the *ray* or margin; a fleshy expansion of the receptacle of a flower, 113.
Disk-flowers, those of the disk in Compositæ.
Dissected, cut deeply into many lobes or divisions.
Dissepiments, the partitions of a compound ovary or a fruit, 108.
Dissilient, bursting in pieces.
Distichous, two-ranked.
Distinct, uncombined with each other, 95.
Dithecous, of two thecæ or anther-cells.
Divaricate, straddling; very widely divergent.
Divided (leaves, &c.), cut into divisions down to the base or midrib, 55.
Dodeca, Greek for twelve; as *Dodecagynous*, with twelve pistils or styles, *Dodecandrous*, with twelve stamens.
Dodrans, span-long.
Dolabriform, axe-shaped.
Dorsal, pertaining to the back (*dorsum*) of an organ. *Dorsal Suture*, 106.
Dotted Ducts, 148.
Double Flowers, where the petals are multiplied unduly, 79.
Downy, clothed with a coat of soft and short hairs.
Drupaceous, like or pertaining to a drupe.
Drupe, a stone-fruit, 120. *Drupelet* or *Drupel*, a little drupe.
Ducts, the so-called vessels of plants, 134.
Dumose, bushy, or relating to bushes.
Duramen, the heart-wood, 142.
Dwarf, remarkably low in stature.

E-, as a prefix of Latin compound words, means destitute of; as *ecostate*, without a rib or midrib; *exalbuminous*, without albumen, &c.
Eared, see *auriculate*, 53.
Ebracteate, destitute of bracts. *Ebracteolate*, destitute of bractlets.
Eburneous, ivory-white.
Echinate, armed with prickles (like a hedgehog). *Echinulate*, a diminutive of it.
Edentate, toothless.
Effete, past bearing, &c.; said of anthers which have discharged their pollen.
Effuse, very loosely branched and spreading.
Eglandulose, destitute of glands.
Elaters, threads mixed with the spores of Liverworts, 165.
Ellipsoidal, approaching an elliptical figure.
Elliptical, oval or oblong, with the ends regularly rounded, 52.
Emarginate, notched at the summit, 54.
Embryo, the rudimentary plantlet in a seed, 11, 127.
Embryonal, belonging or relating to the embryo.
Embryo-sac, 117.

Emersed, raised out of water.
Endecagynous, with eleven pistils or styles. *Endecandrous*, with eleven stamens.
Endemic, peculiar to the country geographically.
Endocarp, the inner layer of a pericarp or fruit, 120.
Endochrome, the coloring matter of Algæ and the like.
Endogenous Stems, 138. *Endogenous plants*, an old name for monocotyledons.
Endopleura, inner seed-coat.
Endorhizal, radicle or root sheathed in germination.
Endosperm, the albumen of a seed, 21.
Endostome, the orifice in the inner coat of an ovule.
Ennea-, nine. *Enneagynous*, with nine petals or styles. *Enneandrous*, nine-stamened.
Ensate, *Ensiform*, sword-shaped.
Entire, the margins not at all toothed, notched, or divided, but even, 55.
Entomophilous, said of flowers frequented and fertilized by insects, 113.
Ephemeral, lasting for a day or less, as the corolla of Purslane, &c.
Epi-, Greek for upon.
Epicalyx, such an involucel as that of Malvaceæ.
Epicarp, the outermost layer of a fruit, 120.
Epidermal, relating to the *Epidermis*, or skin of a plant, 50, 141, 143.
Epigœous, growing on the earth, or close to the ground.
Epigynous, upon the ovary, 95, 99.
Epipetalous, borne on the petals or the corolla, 99.
Epiphyllous, borne on a leaf.
Epiphyte, a plant growing on another plant, but not nourished by it, 36.
Epiphytic or *Epiphytal*, relating to *Epiphytes*.
Epipterous, winged at top.
Episperm, the skin or coat of a seed, especially the outer coat.
Equal, alike in number or length.
Equally pinnate, same as abruptly pinnate, 57.
Equitant (riding straddle), 60.
Erion, Greek for wool. *Erianthous*, woolly-flowered. *Eriophorous*, wool-bearing, &c.
Erose, eroded, as if gnawed.
Erostrate, not beaked.
Erythros, Greek for red. *Erythrocarpous*, red-fruited, &c.
Essential Organs of the flower, 80.
Estivation, see *æstivation*.
Etiolated, blanched by excluding the light, as the stalks of Celery.
Eu, Greek prefix, meaning very, or much.
Evergreen, holding the leaves over winter and until new ones appear, or longer.
Ex, Latin prefix; privative in place of "e" when next letter is a vowel. So *Exalate*, wingless; *Exalbuminous* (seed), without albumen, 21.
Excurrent, running out, as when a midrib projects beyond the apex of a leaf, or a trunk is continued to the very top of a tree, 32.
Exiguous, puny.
Exilis, lank or meagre.
Eximius, distinguished for size or beauty.
Exo-, in Greek compounds, outward, as in
Exocarp, outer layer of a pericarp, 120.
Exogenous, outward growing. *Exogenous stems*, 139.
Exorhizal, radicle in germination not sheathed.
Exostome, the orifice in the outer coat of the ovule.
Explanate, spread or flattened out.
Exserted, protruding out of, as the stamens out of the corolla.
Exstipulate, destitute of stipules.
Extine, outer coat of a pollen-grain.
Extra-axillary, said of a branch or bud somewhat out of the axil, 31.
Extrorse, turned outwards; the anther is extrorse when fastened to the filament on the side next the pistil, and opening on the outer side, 101.

Falcate, scythe-shaped; a flat body curved, its edges parallel.
False Racemes, 78.
Family, in botany same as Order, 177.
Farina, meal or starchy matter, 136.
Farinaceous, mealy in texture. *Farinose*, covered with a mealy powder.
Fasciate, banded; also applied to monstrous stems which grow flat.
Fascicle, a close cluster, 77.
Fascicled, *Fasciculated*, growing in a bundle or tuft, as the leaves of Larch, 68, and roots of Peony, 35.
Fastigiate, close, parallel, and upright, as the branches of Lombardy Poplar.
Faux (plural, *fauces*), the throat of a calyx, corolla, &c., 89.
Faveolate, *Favose*, honeycombed; same as *alveolate*.
Feather-veined, with veins of a leaf all springing from the sides of a midrib, 51.
Fecula or *Fœcula*, starch, 136.
Female flower or *plant*, one bearing pistils only.
Fenestrate, pierced with one or more large holes, like windows.
Ferrugineous, or *Ferruginous*, resembling iron-rust; red-grayish.
Fertile, fruit-bearing, or capable of it; also said of anthers producing good pollen.
Fertilization, the process by which pollen causes the embryo to be formed, 114.
Fibre (woody), 133. *Fibrous*, containing much fibre, or composed of fibres.
Fibrillose, formed of small fibres, or *Fibrillæ*.
Fibro-vascular bundle or tissue, formed of fibres and vessels.
Fiddle-shaped, obovate with a deep recess on each side.
Fidus, Latin suffix for cleft, as *Bifid*, two-cleft.
Filament, the stalk of a stamen, 14, 80, 101; also any slender thread-shaped body.
Filamentose, or *Filamentous*, bearing or formed of slender threads.
Filiform, thread-shaped; long, slender, and cylindrical.
Fimbriate, fringed; furnished with fringes (*fimbriæ*).
Fimbrillate, *Fimbrilliferous*, bearing small *fimbriæ*, i. e. *fimbrillæ*.
Fissiparous, multiplying by division of one body into two.
Fissus, Latin for split or divided.
Fistular, or *Fistulose*, hollow and cylindrical, as the leaves of the Onion.
Flabelliform, or *Flabellate*, fan-shaped.
Flagellate, or *Flagelliform*, long, narrow, and flexible, like the thong of a whip; or like the runners (*flagellæ*) of the Strawberry.
Flavescent, yellowish, or turning yellow.
Flavus, Latin for yellow.
Fleshy, composed of firm pulp or flesh.
Flexuose, or *Flexuous*, bending in opposite directions, in a zigzag way.
Floating, swimming on the surface of water.
Floccose, composed of or bearing tufts of woolly or long and soft hairs.
Flora (the goddess of flowers), the plants of a country or district, taken together, or a work systematically describing them, 9.
Floral Envelopes, or *Flower-leaves*, 79.
Floret, a diminutive flower, one of a mass or cluster.
Floribund, abundantly floriferous.
Florula, the flora of a small district.
Flos, *floris*, Latin for flower.
Flosculus, diminutive, same as floret.
Flower, the whole organs of reproduction of Phænogamous plants, 14, 72.
Flower-bud, an unopened flower.
Flowering Plants, 10, 156. *Flowerless Plants*, 10, 156.
Fly-trap leaves, 65.
Fluitans, Latin for floating. *Fluviatile*, belonging to a river or stream.
Foliaceous, belonging to, or of the texture or nature of, a leaf (*folium*).
Foliate, provided with leaves. Latin prefixes denote the number of leaves, as *bifoliate*, *trifoliate*, &c. *Foliose*, leafy; abounding in leaves.
Foliolate, relating to or bearing leaflets (*foliola*); *trifoliate*, with three leaflets, &c.

Folium (plural, *folia*), Latin for leaf.
Follicle, a simple pod, opening down the inner suture, 122.
Follicular, resembling or belonging to a follicle.
Food of Plants, 144.
Foot-stalk, either petiole or peduncle, 49.
Foramen, a hole or orifice, as that of the ovule, 110.
Foraminose, *Foraminulose*, pierced with holes.
Forked, branched in two or three or more.
Fornicate, bearing fornices.
Fornix, little arched scales in the throat of some corollas, as of Comfrey.
Foveate, deeply pitted. *Foveolate*, diminutive of *foveate*.
Free, not united with any other parts of a different sort, 95.
Fringed, the margin beset with slender appendages, bristles, &c.
Frond, what answers to leaves in Ferns, &c., 157; or to the stem and leaves fused into one, as in Liverwort.
Frondescence, the bursting into leaf.
Frondose, frond-bearing; like a frond, or sometimes used for leafy.
Fructification, the state or result of fruiting.
Fructus, Latin for fruit.
Fruit, the matured ovary and all it contains or is connected with, 117.
Fruit-dots in Ferns; see *Sorus*.
Frustulose, consisting of a chain of similar pieces, or *Frustules*.
Frutescent, somewhat shrubby; becoming a shrub (*Frutex*), 39.
Fruticulose, like a small shrub, or *Fruticulus*. *Fruticose*, shrubby, 39.
Fugacious, soon falling off or perishing.
Fulcrate, having accessory organs or *fulcra*, i. e. props.
Fulvous, tawny; dull yellow with gray.
Fungus, *Fungi*, 172.
Funicle, *Funiculus*, the stalk of a seed or ovule, 110.
Funnelform, or *funnel-shaped*, expanding gradually upwards into an open mouth, like a funnel or tunnel, 90.
Furcate, forked.
Furfuraceous, covered with bran-like fine scurf.
Furrowed, marked by longitudinal channels or grooves.
Fuscous, deep gray-brown.
Fusiform, spindle-shaped, 36.

Galbalus, the fleshy or at length woody cone of Juniper and Cypress.
Galea, a helmet-shaped body, as the upper sepal of the Monkshood, 87.
Galeate, shaped like a helmet.
Gamopetalous, of united petals, 89.
Gamophyllous, formed of united leaves. *Gamosepalous*, formed of united sepals, 89.
Geminate, twin; in pairs.
Gemma, Latin for a bud.
Gemmation, the state of budding; budding growth.
Gemmule, a small bud; the plumule, 6.
Genera, plural of genus.
Geniculate, bent abruptly, like a knee (*genu*), as many stems.
Generic Names, 179.
Genus, a kind of a rank above species, 177.
Germ, a growing point; a young bud; sometimes the same as embryo, 127.
Germen, the old name for ovary.
Germination, the development of a plantlet from the seed, 12.
Gerontogæous, inhabiting the Old World.
Gibbous, more tumid at one place or on one side than the other
Gilvous, dirty reddish-yellow.
Glabrate, becoming glabrous with age, or almost glabrous.
Glabrous, smooth, in the sense of having no hairs, bristles, or other pubescence.

Gladiate, sword-shaped, as the leaves of Iris.
Glands, small cellular organs which secrete oily or aromatic or other products; they are sometimes sunk in the leaves or rind, as in the Orange, Prickly Ash, &c.; sometimes on the surface as small projections; sometimes raised on hairs or bristles (*glandular hairs*, *&c.*), as in the Sweetbrier and Sundew. The name is also given to any small swellings, &c., whether they secrete anything or not; so that the word is loosely used.
Glandular, *Glandulose*, furnished with glands, or gland-like.
Glans (*Gland*), the acorn or mast of Oak and similar fruits.
Glareose, growing in gravel.
Glaucescent, slightly glaucous, or bluish-gray.
Glaucous, covered with a *bloom*, viz. with a fine white powder of wax that rubs off, like that on a fresh plum, or a cabbage-leaf.
Globose, spherical in form, or nearly so. *Globular*, nearly globose.
Glochidiate, or *Glochideous*, (bristles) barbed; tipped with barbs, or with a double hooked point.
Glomerate, closely aggregated into a dense cluster.
Glomerule, a dense head-like cluster, 77.
Glossology, the department of botany in which technical terms are explained.
Glumaceous, glume-like, or glume-bearing.
Glume; Glumes are the husks or floral coverings of Grasses, or, particularly, the outer husks or bracts of each spikelet.
Glumelles, the inner husks of Grasses.
Gonophore, a stipe below stamens, 113.
Gossypine, cottony, flocculent.
Gracilis, Latin for slender.
Grain, see *Caryopsis*, 121.
Gramineous, grass-like.
Granular, composed of grains. *Granule*, a small grain.
Graveolent, heavy-scented.
Griseous, gray or bluish-gray.
Growth, 129.
Grumous, or *Grumose*, formed of coarse clustered grains.
Guttate, spotted, as if by drops of something colored.
Gymnos, Greek for naked, as
Gymnocarpous, naked-fruited. *Gymnospermous*, naked-seeded, 109.
Gymnospermous gynœcium, 109.
Gymnospermæ, or *Gymnospermous Plants*, 183.
Gynandrous, with stamens borne on, i. e. united with, the pistil, 99.
Gynœcium, a name for the pistils of a flower taken altogether, 105.
Gynobase, a depressed receptacle or support of the pistil or carpels, 114.
Gynophore, a stalk raising a pistil above the stamens, 113.
Gynostegium, a sheath around pistils, of whatever nature.
Gynostemium, name of the column in Orchids, &c., consisting of style and stigma with stamens combined.
Gyrate, coiled or moving circularly.
Gyrose, strongly bent to and fro.

Habit, the general aspect of a plant, or its mode of growth.
Habitat, the situation or country in which a plant grows in a wild state.
Hairs, hair-like growths on the surface of plants.
Hairy, beset with hairs, especially longish ones.
Halberd-shaped, see *hastate*, 53.
Halved, when appearing as if one half of the body were cut away.
Hamate, or *Hamose*, hooked; the end of a slender body bent round.
Hamulose, bearing a small hook; a diminutive of the last.
Haplo-, in Greek compounds, single; as *Haplostemonous*, having only one series of stamens.

Hastate, or *Hastile*, shaped like a halberd; furnished with a spreading lobe on each side at the base, 53.
Head, capitulum, a form of inflorescence, 74.
Heart-shaped, of the shape of a heart as painted on cards, 53.
Heart-wood, the older or matured wood of exogenous trees, 142.
Helicoid, coiled like a *helix* or snail-shell, 77.
Helmet, the upper sepal of Monkshood is so called.
Helvolous, grayish-yellow.
Hemi- in compounds from the Greek, half; e. g *Hemispherical*, &c.
Hemicarp, half-fruit, one carpel of an Umbelliferous plant, 121.
Hemitropous (ovule or seed), nearly same as *amphitropous*, 123.
Hepta- (in words of Greek origin), seven; as *Heptagynous*, with seven pistils or styles. *Heptamerous*, its parts in sevens. *Heptandrous*, having seven stamens.
Herb, plant not woody, at least above ground.
Herbaceous, of the texture of an herb; not woody, 39.
Herbarium, the botanist's arranged collection of dried plants, 186.
Herborization, 184.
Hermaphrodite (flower), having stamens and pistils in the same blossom, 81.
Hesperidium, orange-fruit, a hard-rinded berry.
Hetero-, in Greek compounds, means of two or more sorts, as
Heterocarpous, bearing fruit of two kinds or shapes.
Heterogamous, bearing two or more sorts of flowers in one cluster.
Heterogony, *Heterogone*, or *Heterogonous*, with stamens and pistil reciprocally of two sorts, 116. *Heterostyled* is same.
Heteromorphous, of two or more shapes.
Heterophyllous, with two sorts of leaves.
Heterotropous (ovule), the same as *amphitropous*, 123.
Hexa- (in Greek compounds), six; as *Hexagonal*, six-angled. *Hexagynous*, with six pistils or styles. *Hexamerous*, its parts in sixes. *Hexandrous*, with six stamens. *Hexapterous*, six-winged
Hibernaculum, a winter bud.
Hiemal, relating to winter.
Hilar, belonging to the hilum.
Hilum, the scar of the seed; its place of attachment, 110, 126.
Hippocrepiform, horseshoe-shaped.
Hirsute, clothed with stiffish or beard-like hairs.
Hirtellous, minutely hirsute.
Hispid, bristly, beset with stiff hairs. *Hispidulous*, diminutive of hispid.
Histology, 9.
Hoary, grayish-white; see *canescent*, &c.
Holosericeous, all over sericeous or silky.
Homo-, in Greek compounds, all alike or of one sort.
Homodromous, running in one direction.
Homogamous, a head or cluster with flowers all of one kind.
Homogeneous, uniform in nature; all of one kind.
Homogone, or *Homogonous*, counterpart of *Heterogone* or *Homostyled*.
Homologous, of same type; thus petals and sepals are the homologues of leaves.
Homomallous (leaves, &c.), originating all round an axis, but all bent or curved to one side.
Homorphous, all of one shape.
Homotropous (embryo), curved with the seed; curved only one way.
Hood, same as *helmet* or *galea*. *Hooded*, hood-shaped; see *cucullate*.
Hooked, same as *hamate*.
Horn, a spur or some similar appendage. *Horny*, of the texture of horn.
Hortensis, pertaining to the garden.
Hortus Siccus, an herbarium, or collection of dried plants, 201.
Humifuse, *Humistrate*, spread over the surface of the ground.
Humilis, low in stature.

Hyaline, transparent, or partly so.
Hybrid, a cross-breed between two allied species, 176.
Hydrophytes, water-plants.
Hyemal, see *hiemal*.
Hymenium of a Mushroom, 172.
Hypanthium, a hollow flower-receptacle, such as that of Rose.
Hypo-, Greek prefix for under, or underneath.
Hypocotyle, or *Hypocotyl*, part of stem below the cotyledons, 11.
Hypocrateriform, properly *Hypocraterimorphous*, salver-shaped.
Hypogæan, or *Hypogæous*, produced under ground, 19.
Hypogynous, inserted under the pistil, 95, 99.
Hysteranthous, with the blossoms developed earlier than the leaves.

Icosandrous, having 20 (or 12 or more) stamens inserted on the calyx.
Imberbis, Latin for beardless.
Imbricate, *Imbricated*, *Imbricative*, overlapping one another, like tiles or shingles on a roof, as the bud-scales of Horse-chestnut and Hickory, 27. In æstivation, where some leaves of the calyx or corolla are overlapped on both sides by others, 98.
Immarginate, destitute of a rim or border.
Immersed, growing wholly under water.
Impari-pinnate, pinnate with a single leaflet at the apex, 57.
Imperfect flowers, wanting either stamens or pistils, 85.
Inæquilateral, unequal-sided, as the leaf of a Begonia.
Inane, empty, said of an anther which produces no pollen, &c.
Inappendiculate, not appendaged.
Incanous, *Incanescent*, hoary with soft white pubescence.
Incarnate, flesh-colored.
Incised, cut rather deeply and irregularly, 58.
Included, enclosed; when the part in question does not project beyond another.
Incomplete Flower, wanting calyx or corolla, 86.
Incrassated, thickened.
Incubous, with tip of one leaf lying flat over the base of the next above.
Incumbent, leaning or resting upon; the cotyledons are incumbent when the back of one of them lies against the radicle, 128; the anthers are incumbent when turned or looking inwards.
Incurved, gradually curving inwards.
Indefinite, not uniform in number, or too numerous to mention (over 12).
Indefinite or *Indeterminate Inflorescence*, 72.
Indehiscent, not splitting open; i. e. not dehiscent, 119.
Indigenous, native to the country.
Individuals, 175.
Indumentum, any hairy coating or pubescence.
Induplicate, with the edges turned inwards, 97.
Induviate, clothed with old and withered parts or *induviæ*.
Indusium, the shield or covering of a fruit-dot of a Fern, 159.
Inermis, Latin for unarmed, not prickly.
Inferior, growing below some other organ, 96.
Infertile, not producing seed, or pollen, as the case may be.
Inflated, turgid and bladdery.
Inflexed, bent inwards.
Inflorescence, the arrangement of flowers on the stem, 72.
Infra-axillary, situated beneath the axil.
Infundibuliform or *Infundibular*, funnel-shaped, 90.
Innate (anther), attached by its base to the very apex of the filament, 101.
Innovation, a young shoot, or new growth.
Insertion, the place or the mode of attachment of an organ to its support, 95, 99.
Integer, entire, not lobed. *Integerrimus*, quite entire, not serrate.

Intercellular Passages or *Spaces*, 131, 143.
Interfoliaceous, between the leaves of a pair or whorl.
Internode, the part of a stem between two nodes, 13.
Interpetiolar, between petioles.
Interruptedly pinnate, pinnate with small leaflets intermixed with larger.
Intine, inner coat of a pollen grain.
Intrafoliaceous (stipules, &c.), placed between the leaf or petiole and the stem.
Introrse, turned or facing inwards; i. e. towards the axis of the flower, 101.
Intruse, as it were pushed inwards.
Inversed or *Inverted*, where the apex is in the direction opposite to that of the organ it is compared with.
Involucel, a partial or small involucre, 76.
Involucellate, furnished with an involucel. *Involucrate*, furnished with an involucre.
Involucre, a whorl or set of bracts around a flower, umbel, or head, &c., 74, 75.
Involute, in vernation, 72; rolled inwards from the edges, 97.
Irregular Flowers, 86, 91.
Isos, Greek for equal in number. *Isomerous*, the same number in the successive circles or sets. *Isostemonous*, the stamens equal in number to the sepals or petals.

Jointed, separate or separable at one or more places into pieces, 64, &c.
Jugum (plural *Juga*), Latin for a pair, as of leaflets, — thus *Unijugate*, of a single pair; *Bijugate*, of two pairs, &c.
Julaceus, like a catkin or *Julus*.

Keel, a projecting ridge on a surface, like the keel of a boat; the two anterior petals of a papilionaceous corolla, 92.
Keeled, furnished with a keel or sharp longitudinal ridge.
Kermesine, Carmine-red.
Kernel of the ovule and seed, 110.
Key, or *Key-fruit*, a Samara, 122.
Kidney-shaped, resembling the outline of a kidney, 53.

Labellum, the odd petal in the Orchis Family.
Labiate, same as *bilabiate* or two-lipped, 92.
Labiatiflorous, having flowers with bilabiate corolla.
Labium (plural, *Labia*), Latin for lip.
Lacerate, with margin appearing as if torn.
Laciniate, slashed; cut into deep narrow lobes or *Laciniæ*.
Lactescent, producing milky juice, as does the Milkweed, &c.
Lacteus, Latin for milk-white.
Lacunose, full of holes or gaps.
Lacustrine, belonging to lakes.
Lævigate, smooth as if polished. Latin, *Lævis*, smooth, as opposed to rough.
Lageniform, gourd-shaped.
Lagopous, Latin, hare-footed; densely clothed with long soft hairs.
Lamellar or *Lamellate*, consisting of flat plates, *Lamellæ*.
Lamina, a plate or blade, the blade of a leaf, &c., 49.
Lanate, *Lanose*, woolly; clothed with long and soft entangled hairs.
Lanceolate, lance-shaped, 52.
Lanuginous, cottony or woolly.
Latent buds, concealed or undeveloped buds, 30.
Lateral, belonging to the side.
Latex, the milky juice, &c., of plants, 135.
Lax (*Laxus*), loose in texture, or sparse; the opposite of crowded.
Leaf, 49. *Leaf-buds*, 31.
Leaflet, one of the divisions or blades of a compound leaf, 57.
Leaf-like, same as *foliaceous*.
Leathery, of about the consistence of leather; coriaceous.

Legume, a simple pod which dehisces in two pieces, like that of the Pea, 122.
Leguminous, belonging to legumes, or to the Leguminous Family.
Lenticular, lens-shaped; i. e. flattish and convex on both sides.
Lappaceous, bur-like.
Lasio, Greek for woolly or hairy, as *Lasianthus*, woolly-flowered.
Lateritious, brick-colored.
Laticiferous, containing latex, 138.
Latus, Latin for broad, as *Latifolius*, broad-leaved.
Leaf-scar, *Leaf stalk*, petiole.
Lenticels, lenticular dots on young bark.
Lentiginose, as if freckled.
Lepal, a made-up word for a staminode.
Lepis, Greek for a scale, whence *Lepidote*, leprous; covered with scurfy scales.
Leptos, Greek for slender; so *Leptophyllous*, slender-leaved.
Leukos, Greek for white; whence *Leucanthous*, white-flowered, &c.
Liber, the inner bark of Exogenous stems, 140.
Lid, see *operculum*.
Ligneous, or *Lignose*, woody in texture.
Ligulate, furnished with a ligule, 93.
Ligule, *Ligula*, the strap-shaped corolla in many Compositæ, 93; the membranous appendage at the summit of the leaf-sheaths of most Grasses, 57.
Limb, the border of a corolla, &c., 89.
Limbate, bordered (Latin, *Limbus*, a border).
Line, the twelfth of an inch; or French lines, the tenth.
Linear, narrow and flat, the margins parallel, 52.
Lineate, marked with parallel lines. *Lineolate*, marked with minute lines.
Lingulate, *Linguiform*, tongue-shaped.
Lip, the principal lobes of a bilabiate corolla or calyx, 92.
Litoral or *Littoral*, belonging to the shore.
Livid, pale lead-colored.
Lobe, any projection or division (especially a rounded one) of a leaf, &c.
Lobed or *Lobate*, cut into lobes, 55, 56; *Lobulate*, into small lobes.
Locellate, having *Locelli*, i. e. compartments in a cell: thus an anther-cell is often *bilocellate*.
Loculament, same as *loculus*.
Locular, relating to the cell or compartment (*Loculus*) of an ovary, &c.
Loculicidal (dehiscence), splitting down through the back of each cell, 123.
Locusta, a name for the spikelet of Grasses.
Lodicule, one of the scales answering to perianth-leaves in Grass-flowers.
Loment, a pod which separates transversely into joints, 122.
Lomentaceous, pertaining to or resembling a loment.
Lorate, thong-shaped.
Lunate, crescent-shaped. *Lunulate*, diminutive of *lunate*.
Lupuline, like hops.
Lusus, Latin for a sport or abnormal variation.
Luteolus, yellowish; diminutive of
Luteus, Latin for yellow. *Lutescent*, verging to yellow.
Lyrate, lyre-shaped; a pinnatifid leaf of an obovate or spatulate outline, the end-lobe large and roundish, and the lower lobes small, as in fig. 149.

Macros, Greek for long, sometimes also used for large; thus *Macrophyllous*, long- or large-leaved, &c.
Macrospore, the large kind of spore, when there are two kinds, 160, 161.
Maculate, spotted or blotched.
Male (flowers or plants), having stamens but no pistil.
Mammose, breast-shaped.
Marcescent, withering without falling off.
Marginal, belonging to margin.

Marginate, margined with an edge different from the rest.
Marginicidal dehiscence, 123.
Maritime, belonging to sea-coasts.
Marmorate, marbled.
Mas., *Masc.*, *Masculine*, male.
Masked, see *personate*.
Mealy, see *farinaceous*.
Median, *Medial*, belonging to the middle.
Medifixed, attached by the middle.
Medullary, belonging to, or of the nature of, pith (*Medulla*); pithy.
Medullary Rays, the silver-grain of wood, 140, 141.
Medullary Sheath, a set of ducts just around the pith, 140.
Meiostemonous, having fewer stamens than petals.
Membranaceous or *Membranous*, of the texture of membrane; thin and soft.
Meniscoid, crescent-shaped.
Mericarp, one carpel of the fruit of an Umbelliferous plant, 121.
Merismatic, separating into parts by the formation of partitions across.
Merous, from the Greek for part; used with numeral prefix to denote the number of pieces in a set or circle: as *Monomerous*, of only one, *Dimerous*, with two, *Trimerous*, with three parts (sepals, petals, stamens, &c.) in each circle.
Mesocarp, the middle part of a pericarp, when that is distinguishable into three layers, 120.
Mesophlœum, the middle or green bark.
Micropyle, the closed orifice of the seed, 110, 126.
Microspore, the smaller kind of spore when there are two kinds, 161.
Midrib, the middle or main rib of a leaf, 50.
Milk-vessels, 138.
Miniate, vermilion-colored.
Mitriform, mitre-shaped: in the form of a peaked cap, or one cleft at the top.
Moniliform, necklace-shaped; a cylindrical body contracted at intervals.
Monocarpic (duration), flowering and seeding but once, 38.
Monochlamydeous, having only one floral envelope.
Monocotyledonous (embryo), with only one cotyledon, 24.
Monocotyledonous Plants, 24. *Monocotyls*, 24.
Monœcious, or *Monoicous* (flower), having stamens or pistils only, 85.
Monogynous (flower), having only one pistil, or one style, 105.
Monopetalous (flower), with the corolla of one piece, 89.
Monophyllous, one-leaved, or of one piece.
Monos, Greek for solitary or only one; thus *Monadelphous*, stamens united by their filaments into one set, 99; *Monandrous* (flower), having only one stamen, 100.
Monosepalous, a calyx of one piece; i. e. with the sepals united into one body.
Monospermous, one-seeded.
Monstrosity, an unnatural deviation from the usual structure or form.
Morphology, *Morphological Botany*, 9; the department of botany which treats of the forms which an organ may assume.
Moschate, Musk-like in odor.
Movements, 149.
Mucronate, tipped with an abrupt short point (*Mucro*), 54.
Mucronulate, tipped with a minute abrupt point; a diminutive of the last.
Multi-, in composition, many; as *Multangular*, many-angled; *Multicipital*, many-headed, &c.; *Multifarious*, in many rows or ranks; *Multifid*, many-cleft; *Multilocular*, many-celled; *Multiserial*, in many rows.
Multiple Fruits, 118, 124.
Muricate, beset with short and hard or prickly points.
Muriform, wall-like; resembling courses of bricks in a wall.
Muticous, pointless, blunt, unarmed.
Mycelium, the spawn of Fungi; i. e. the filaments from which Mushrooms, &c., originate, 172.

Naked, wanting some usual covering, as achlamydeous flowers, 86, gymnospermous seeds, 109, 125, &c.
Names in botany, 179.
Nanus, Latin for dwarf.
Napiform, turnip-shaped, 35.
Natural System, 182.
Naturalized, introduced from a foreign country, and flourishing wild.
Navicular, boat-shaped, like the glumes of most Grasses.
Necklace-shaped, looking like a string of beads; see *moniliform*.
Nectar, the sweet secretion in flowers from which bees make honey, &c.
Nectariferous, honey-bearing; or having a nectary.
Nectary, the old name for petals and other parts of the flower when of unusual shape, especially when honey-bearing. So the hollow spur-shaped petals of Columbine were called nectaries; also the curious long-clawed petals of Monkshood, 87, &c.
Needle-shaped, long, slender, and rigid, like the leaves of Pines.
Nemorose or *Nemoral*, inhabiting groves.
Nerve, a name for the ribs or veins of leaves when simple and parallel, 50.
Nerved, furnished with nerves, or simple and parallel ribs or veins, 50.
Nervose, conspicuously nerved. *Nervulose*, minutely nervose.
Netted-veined, furnished with branching veins forming network, 50, 51.
Neuter, *Neutral*, sexless. *Neutral flower*, 79.
Niger, Latin for black. *Nigricans*, Latin for verging to black.
Nitid, shining.
Nival, living in or near snow. *Niveus*, snow-white.
Nodding, bending so that the summit hangs downward.
Node, a knot; the "joints" of a stem, or the part whence a leaf or a pair of leaves springs, 13.
Nodose, knotty or knobby. *Nodulose*, furnished with little knobs or knots.
Nomenclature, 175, 179.
Normal, according to rule, natural.
Notate, marked with spots or lines of a different color.
Nucamentaceous, relating to or resembling a small nut.
Nuciform, nut-shaped or nut-like.
Nucleus, the kernel of an ovule (110) or seed (127) of a cell.
Nucule, same as nutlet.
Nude, (Latin, *Nudus*), naked. So *Nudicaulis*, naked-stemmed, &c.
Nut, Latin *Nux*, a hard, mostly one-seeded indehiscent fruit; as a chestnut, butternut, acorn, 121.
Nutant, nodding.
Nutlet, a little nut; or the stone of a drupe.

Ob- (meaning over against), when prefixed to words signifies inversion; as, *Obcompressed*, flattened the opposite of the usual way; *Obcordate*, heart-shaped, with the broad and notched end at the apex instead of the base, 54; *Oblanceolate*, lance-shaped with the tapering point downwards, 52.
Oblique, applied to leaves, &c., means unequal-sided.
Oblong, from two to four times as long as broad, 52.
Obovate, inversely ovate, the broad end upward, 53. *Obovoid*, solid obovate.
Obtuse, blunt or round at the end, 54.
Obverse, same as *inverse*.
Obvolute (in the bud), when the margins of one piece or leaf alternately overlap those of the opposite one.
Ocellate, with a circular colored patch, like an eye.
Ochroleucous, yellowish-white; dull cream-color.
Ocreate, furnished with *Ocreæ* (boots), or stipules in the form of sheaths, 57.
Octo-, Latin for eight, enters into the composition of *Octagynous*, with eight pistils or styles; *Octamerous*, its parts in eights; *Octandrous*, with eight stamens, &c.

Oculate, with eye-shaped marking.
Officinal, used in medicine, therefore kept in the shops.
Offset, short branches next the ground which take root, 40.
Oides, termination, from the Greek, to denote likeness; so *Dianthoides*, Pink-like.
Oleraceous, esculent, as a pot-herb.
Oligos, Greek for few; thus *Oliganthous*, few-flowered, &c.
Olivaceous, olive-green.
Oophoridium, a name for spore-case containing macrospores.
Opaque, applied to a surface, means dull, not shining.
Operculate, furnished with a lid (*Operculum*), as the spore-case of Mosses, 163.
Opposite, said of leaves and branches when on opposite sides of the stem from each other (i. e. in pairs), 29, 68. Stamens are opposite the petals, &c., when they stand before them.
Oppositifolius, situated opposite a leaf.
Orbicular, *Orbiculate*, circular in outline, or nearly so, 52.
Order, group below class, 178. *Ordinal names*, 180.
Organ, any member of the plant, as a leaf, a stamen, &c.
Organography, study of organs, 9. *Organogenesis*, that of the development of organs.
Orgyalis, of the height of a man.
Orthos, Greek for straight; thus, *Orthocarpous*, with straight fruit; *Orthostichous*, straight-ranked.
Orthotropous (ovule or seed), 111.
Osseous, of a bony texture.
Outgrowths, growths from the surface of a leaf, petal, &c.
Oval, broadly elliptical, 52.
Ovary, that part of the pistil containing the ovules or future seeds, 14, 80, 105.
Ovate, shaped like an egg, with the broader end downwards; or, in plain surfaces, such as leaves, like the section of an egg lengthwise, 52.
Ovoid, ovate or oval in a solid form.
Ovule, the body which is destined to become a seed, 14, 80, 105, 110.
Ovuliferous, ovule-bearing.

Palate, a projection of the lower lip of a labiate corolla into the throat, as in Snap-dragon, &c.
Palea (plural *paleæ*), chaff; the inner husks of Grasses; the chaff or bracts on the receptacle of many Compositæ, as Coreopsis, and Sunflower.
Paleaceous, furnished with chaff, or chaffy in texture.
Paleolate, having *Paleolæ* or paleæ of a second order, or narrow paleæ.
Palet, English term for palea.
Palmate, when leaflets or the divisions of a leaf all spread from the apex of the petiole, like the hand with the outspread fingers, 57, 58.
Palmately (veined, lobed, &c.), in a palmate manner, 51, 56.
Palmatifid, *-lobed*, *-sect*, palmately cleft, or lobed, or divided.
Paludose, inhabiting marshes. *Palustrine*, same.
Panduriform, or *Pandurate*, fiddle-shaped (which see).
Panicle, an open and branched cluster, 81.
Panicled, *Paniculate*, arranged in panicles, or like a panicle.
Pannose, covered with a felt of woolly hairs.
Papery, of about the consistence of letter-paper.
Papilionaceous, butterfly-shaped; applied to such a corolla as that of the Pea, 91.
Papilla (plural *papillæ*), little nipple-shaped protuberances.
Papillate, *Papillose*, covered with papillæ.
Pappus, thistle-down. The down crowning the achenium of the Thistle, Groundsel, &c., and whatever in Compositæ answers to calyx, whether hairs, teeth, or scales, 121.
Papyraceous, like parchment in texture.
Parallel-veined or *nerved* (leaves), 50.

Paraphyses, jointed filaments mixed with the antheridia of Mosses.
Parasitic, living as a parasite, i. e. on another plant or animal, 37.
Parenchemytous, composed of parenchyma.
Parenchyma, soft cellular tissue of plants, like the green pulp of leaves, 132.
Parietal (placentæ, &c.), attached to the walls (*parietes*) of the ovary.
Paripinnate, pinnate with an even number of leaflets.
Parted, separated or cleft into parts almost to the base, 55.
Parthenogenesis, producing seed without fertilization.
Partial involucre, same as an *involucel; partial petiole*, a division of a main leaf-stalk or the stalk of a leaflet; *partial peduncle*, a branch of a peduncle; *partial umbel*, an umbellet, 76.
Partition, a segment of a *parted* leaf; or an internal wall in an ovary, anther, &c.
Patelliform, disk-shaped, like the *patella* or kneepan.
Patent, spreading, open. *Patulous*, moderately spreading.
Pauci-, in composition, few; as *pauciflorous*, few-flowered, &c.
Pear-shaped, solid obovate, the shape of a pear.
Pectinate, pinnatifid or pinnately divided into narrow and close divisions, like the teeth of a comb.
Pedate, like a bird's foot; palmate or palmately cleft, with the side divisions again cleft, as in Viola pedata, &c.
Pedicel, the stalk of each particular flower of a cluster, 73.
Pedicellate, Pedicelled, borne on a pedicel.
Pedalis, Latin for a foot high or long.
Peduncle, a flower-stalk, whether of a single flower or of a flower-cluster, 73.
Peduncled, Pedunculate, furnished with a peduncle.
Peloria, an abnormal return to regularity and symmetry in an irregular flower; commonest in Snapdragon.
Peltate, shield-shaped; said of a leaf, whatever its shape, when the petiole is attached to the lower side, somewhere within the margin, 53.
Pelviform, basin-shaped.
Pendent, hanging. *Pendulous*, somewhat hanging or drooping.
Penicillate, Penicilliform, tipped with a tuft of fine hairs, like a painter's pencil; as the stigmas of some Grasses.
Pennate, same as pinnate. *Penninerved* and *Penniveined*, pinnately veined, 51.
Penta- (in words of Greek composition), five; as *Pentadelphous*, 99; *Pentagynous*, with five pistils or styles; *Pentamerous*, with its parts in fives, or on the plan of five; *Pentandrous*, having five stamens, 112; *Pentastichous*, in five ranks, &c.
Pepo, a fruit like the Melon and Cucumber, 119.
Perennial, lasting from year to year, 38.
Perfect (flower), having both stamens and pistils, 81.
Perfoliate, passing through the leaf, in appearance, 60.
Perforate, pierced with holes, or with transparent dots resembling holes, as an Orange-leaf.
Peri-, Greek for around; from which are such terms as
Perianth, the leaves of the flower collectively, 79.
Pericarp, the ripened ovary; the walls of the fruit, 117.
Pericarpic, belonging to the pericarp.
Perigonium, Perigone, same as *perianth*.
Perigynium, bodies around the pistil; applied to the closed cup or bottle-shaped body (of bracts) which encloses the ovary of Sedges, and to the bristles, little scales, &c., of the flowers of some other Cyperaceæ.
Perigynous, the petals and stamens borne on the calyx, 95, 99.
Peripheric, around the outside, or periphery, of any organ.
Perisperm, a name for the albumen of a seed.
Peristome, the fringe of teeth to the spore-case of Mosses, 163.
Persistent, remaining beyond the period when such parts commonly fall, as the leaves of evergreens, and the calyx of such flowers as persist during the growth of the fruit.

Personate, masked; a bilabiate corolla with a *palate* in the throat, 92.
Pertuse, perforated with a hole or slit.
Perulate, having scales (*Perulæ*), such as bud-scales.
Pes, pedis, Latin for the foot or support, whence *Longipes*, long-stalked, &c.
Petal, a leaf of the corolla, 14, 79.
Petalody, metamorphosis of stamens, &c., into petals.
Petaloid, *Petaline*, petal-like; resembling or colored like petals.
Petiole, a footstalk of a leaf; a leaf stalk, 49.
Petioled, *Petiolate*, furnished with a petiole.
Petiolulate, said of a leaflet when raised on its own partial leafstalk.
Petræus, Latin for growing on rocks.
Phalanx, phalanges, bundles of stamens.
Phænogamous, or *Phanerogamous*, plants bearing flowers and producing seeds; same as Flowering Plants. *Phænogams*, *Phanerogams*, 10.
Phlœum, Greek name for bark, whence *Endophlœum*, inner bark, &c.
Phœniceous, deep red verging to scarlet.
Phycology, the botany of Algæ.
Phyllocladia, branches assuming the form and function of leaves.
Phyllodium (plural, *phyllodia*), a leaf where the seeming blade is a dilated petiole, as in New Holland Acacias, 61.
Phyllome, foliar parts, those answering to leaves in their nature.
Phyllon (plural, *phylla*), Greek for leaf and leaves; used in many compound terms and names.
Phyllotaxis, or *Phyllotaxy*, the arrangement of leaves on the stem, 67.
Physiological Botany, 9.
Phytography, relates to characterizing and describing plants.
Phyton, or *Phytomer*, a name used to designate the pieces which by their repetition make up a plant, theoretically, viz. a joint of stem with its leaf or pair of leaves.
Pileus of a mushroom, 172.
Piliferous, bearing a slender bristle or hair (*pilum*), or beset with hairs.
Pilose, hairy; clothed with soft slender hairs.
Pinna, a primary division with its leaflets of a bipinnate or tripinnate leaf.
Pinnule, a secondary division of a bipinnate or tripinnate leaf, 66.
Pinnate (leaf), when leaflets are arranged along the sides of a common petiole, 57.
Pinnately lobed, cleft, parted, divided, veined, 56.
Pinnatifid, *Pinnatisect*, same as pinnately cleft and pinnately parted, 56.
Pisiform, pea-shaped.
Pistil, the seed-bearing organ of the flower, 14, 80, 105.
Pistillate, having a pistil, 85.
Pistillidium, the body which in Mosses answers to the pistil, 159, 164.
Pitchers, 64.
Pith, the cellular centre of an exogenous stem, 138.
Placenta, the surface or part of the ovary to which the ovules are attached, 107.
Placentiform, nearly same as quoit-shaped.
Plaited (in the bud), or *Plicate*, folded, 72, 98.
Platy-, Greek for broad, in compounds, such as *Platyphyllous*, broad-leaved, &c.
Pleio-, Greek for full or abounding, used in compounds, such as *Pleiopetalous*, of many petals, &c.
Plumbeus, lead-colored.
Plumose, feathery; when any slender body (such as a bristle of a pappus or a style) is beset with hairs along its sides, like the plume of a feather.
Plumule, the bud or first shoot of a germinating plantlet above the cotyledons, 13.
Pluri-, in composition, many or several; as *Plurifoliolate*, with several leaflets.
Pod, specially a legume, 122; also may be applied to any sort of capsule.
Podium, a footstalk or stipe, used only in Greek compounds, as (suffixed) *Leptopodus*, slender-stalked, or (prefixed) *Podocephalus*, with a stalked head, and in *Podosperm*, a seed stalk or funiculus.
Pogon, Greek for beard, comes into various compounds.

Pointless, destitute of any pointed tip, such as a *mucro*, *awn*, *acumination*, &c.
Pollen, the fertilizing powder contained in the anther, 14, 80, 103.
Pollen-growth, 117. *Polleniferous*, pollen-bearing.
Pollen-mass, *Pollinium*, the united mass of pollen, 104, as in Milkweed and Orchis.
Pollicaris, Latin for an inch long.
Pollination, the application of pollen to the stigma, 114.
Poly-, in compound words of Greek origin, same as *multi-* in those of Latin origin, viz. many, as
Polyadelphous, stamens united by their filaments into several bundles, 100.
Polyandrous, with numerous stamens (inserted on the receptacle), 100.
Polycarpic, term used by DeCandolle in the sense of perennial.
Polycotyledonous, having many (more than two) cotyledons, as Pines, 23.
Polygamous, having some perfect and some unisexual flowers, 85.
Polygonal, many-angled.
Polygynous, with many pistils or styles, 105.
Polymerous, formed of many parts of each set.
Polymorphous, of several or varying forms.
Polypetalous, when the petals are distinct or separate (whether few or many), 89.
Polyphyllous, many-leaved; formed of several distinct pieces.
Polysepalous, same as the last when applied to the calyx, 89.
Polyspermous, many-seeded.
Pome, the apple, pear, and similar fleshy fruits, 119.
Pomiferous, pome-bearing.
Porrect, outstretched.
Posterior side or portion of a flower (when axillary) is that toward the axis, 96.
Pouch, the silicle or short pod, as of Shepherd's Purse, 123.
Præcocious (Latin, *præcox*), unusually early in development.
Præfloration, same as *æstivation*, 97.
Præfoliation, same as *vernation*, 71.
Præmorse, ending abruptly, as if bitten off.
Pratensis, Latin for growing in meadows.
Prickles, sharp elevations of the bark, coming off with it, as of the Rose.
Prickly, bearing prickles, or sharp projections like them.
Primine, the outer coat of the covering of the ovule, 110.
Primordial, earliest formed; primordial leaves are the first after the cotyledons.
Prismatic, prism-shaped; having three or more angles bounding flat sides.
Procerous, tall, or tall and slim.
Process, any projection from the surface or edge of a body.
Procumbent, trailing on the ground, 39.
Procurrent, running through but not projecting.
Produced, extended or projecting; the upper sepal of a Larkspur is *produced* above into a spur, 87.
Proliferous (literally, bearing offspring), where a new branch rises from an older one, or one head or cluster of flowers out of another.
Propaculum or *Propagulum*, a shoot for propagation.
Prosenchyma, a tissue of wood-cells.
Prostrate, lying flat on the ground, 39.
Protandrous or *Proterandrous*, the anthers first maturing, 116.
Proteranthous, flowering before leafing.
Proterogynous or *Protogynous*, the stigmas first to mature, 116.
Prothallium or *Prothallus*, 160.
Protoplasm, the soft nitrogenous lining or contents, or living part, of cells, 129.
Protos, Greek for first; in various compounds.
Pruinose, *Pruinate*, frosted; covered with a powder like hoar-frost.
Pseudo-, Greek for false. *Pseudo-bulb*, the aerial corms of epiphytic Orchids, &c.
Psilos, Greek for bare or naked, used in many compounds.
Pteridophyta, *Pteridophytes*, 156.
Pteris, Greek for wing, and general name for Fern, enters into many compounds.

Puberulent, covered with fine and short or almost imperceptible down.
Pubescent, hairy or downy, especially with fine and soft hairs or *pubescence*.
Pulverulent or *Pulveraceous*, as if dusted with fine powder.
Pulvinate, cushioned, or shaped like a cushion.
Pumilus, low or little.
Punctate, dotted, either with minute holes or what look as such.
Puncticulate, minutely punctate.
Pungent, prickly-tipped.
Puniceous, carmine-red.
Purpureus, originally red or crimson, more used for duller or bluish-red.
Pusillus, weak and small, tiny.
Putamen, the stone of a drupe, or the shell of a nut, 120.
Pygmæus, Latin for dwarf.
Pyramidal, shaped like a pyramid.
Pyrene, *Pyrena*, a seed-like nutlet or stone of a small drupe.
Pyriform, pear-shaped.
Pyxidate, furnished with a lid.
Pyxis, *Pyxidium*, a pod opening round horizontally by a lid, 124.

Quadri-, in words of Latin origin, four; as *Quadrangular*, four-angled; *Quadrifoliate*, four-leaved; *Quadrifid*, four-cleft. *Quaternate* in fours.
Quinate, in fives. *Quinque*, five.
Quincuncial, in a quincunx; when the parts in æstivation are five, two of them outside, two inside, and one half out and half in.
Quintuple, five-fold.

Race, a marked variety which may be perpetuated from seed, 176.
Raceme, a flower-cluster, with one-flowered pedicels arranged along the sides of a general peduncle, 73.
Racemose, bearing racemes, or raceme-like.
Rachis, see *rhachis*.
Radial, belonging to the ray.
Radiate, or *Radiant*, furnished with ray-flowers, 94.
Radiate-veined, 52.
Radical, belonging to the root, or apparently coming from the root.
Radicant, rooting, taking root on or above the ground.
Radicels, little roots or rootlets.
Radicle, the stem part of the embryo, the lower end of which forms the root, 11, 127.
Rameal, belonging to a branch. *Ramose*, full of branches (*rami*).
Ramentaceous, beset with thin chaffy scales (*Ramenta*), as the stalks of many Ferns.
Ramification, branching, 27.
Ramulose, full of branchlets (*ramuli*).
Raphe, see *rhaphe*.
Ray, parts diverging from a centre, the marginal flowers of a head (as of Coreopsis, 94), or cluster, as of Hydrangea (78), when different from the rest, especially when ligulate and diverging (like rays or sunbeams); also the branches of an umbel, 74.
Ray-flowers, 94.
Receptacle, the axis or support of a flower, 81, 112; also the common axis or support of a head of flowers, 73.
Reclined, turned or curved downwards; nearly recumbent.
Rectinerved, with straight nerves or veins.
Recurved, curved outwards or backwards.
Reduplicate (in æstivation), valvate with the margins turned outwards, 97.
Reflexed, bent outwards or backwards.
Refracted, bent suddenly, so as to appear broken at the bend.
Regular, all the parts similar in shape, 82.
Reniform, kidney-shaped, 53.

Repand, wavy-margined, 55.
Repent, creeping, i. e. prostrate and rooting underneath.
Replum, the frame of some pods (as of Prickly Poppy and Cress), persistent after the valves fall away.
Reptant, same as repent.
Resupinate, inverted, or appearing as if upside down, or reversed.
Reticulated, the veins forming network, 50. *Retiform*, in network.
Retinerved, reticulate-veined.
Retroflexed, bent backwards; same as *reflexed*.
Retuse, blunted; the apex not only obtuse but somewhat indented, 54.
Revolute, rolled backwards, as the margins of many leaves, 72.
Rhachis (the backbone), the axis of a spike or other body, 73.
Rhaphe, the continuation of the seed-stalk along the side of an anatropous ovule or seed, 112, 126.
Rhaphides, crystals, especially needle-shaped ones, in the tissues of plants, 137.
Rhizanthous, flowering from the root.
Rhizoma, *Rhizome*, a rootstock, 42–44.
Rhombic, in the shape of a rhomb. *Rhomboidal*, approaching that shape.
Rib, the principal piece, or one of the principal pieces of the framework of a leaf, or any similar elevated line along a body, 49, 50.
Rimose, having chinks or cracks.
Ring, an elastic band on the spore-cases of Ferns, 159.
Ringent, grinning; gaping open, 92.
Riparious, on river-banks.
Rivalis, Latin for growing along brooks; or *Rivularis*, in rivulets.
Root, 33.
Root-hairs, 35.
Rootlets, small roots, or root-branches, 33.
Rootstock, root-like trunks or portions of stems on or under ground, 42.
Roridus, dewy.
Rosaceous, arranged like the petals of a rose.
Rostellate, bearing a small beak (*Rostellum*).
Rostrate, bearing a beak (*Rostrum*) or a prolonged appendage.
Rosulate, in a rosette or cluster of spreading leaves.
Rotate, wheel-shaped, 89.
Rotund, rounded or roundish in outline.
Ruber, Latin for red in general. *Rubescent*, *Rubicund*, reddish or blushing.
Rudimentary, imperfectly developed, or in an early state of development.
Rufous, *Rufescent*, brownish-red or reddish-brown.
Rugose, wrinkled; roughened with wrinkles.
Ruminated (albumen), penetrated with irregular channels or portions, as a nutmeg, looking as if chewed.
Runcinate, coarsely saw-toothed or cut, the pointed teeth turned towards the base of the leaf, as the leaf of a Dandelion.
Runner, a slender and prostrate branch, rooting at the end, or at the joints, 40.

Sabulose, growing in sand.
Sac, any closed membrane, or a deep purse-shaped cavity.
Saccate, sac-shaped.
Sagittate, arrowhead-shaped, 53.
Salsuginous, growing in brackish soil.
Salver-shaped, or *Salver-form*, with a border spreading at right angles to a slender tube, 89.
Samara, a wing-fruit, or key, 122.
Samaroid, like a samara or key-fruit.
Sap, the juices of plants generally, 136. *Sapwood*, 142.
Saprophytes, 37.
Sarcocarp, the fleshy part of a stone-fruit, 120.

Sarmentaceous, *Sarmentose*, bearing long and flexible twigs (*Sarments*), either spreading or procumbent.
Saw-toothed, see *serrate*, 55.
Scabrous, rough or harsh to the touch.
Scalariform, with cross-bands, resembling the steps of a ladder, 134.
Scales, of buds, 28; of bulbs, &c., 46.
Scalloped, same as *crenate*, 55.
Scaly, furnished with scales, or scale-like in texture.
Scandent, climbing, 39.
Scape, a peduncle rising from the ground or near it, as in many Violets.
Scapiform, scape-like.
Scapigerous, scape-bearing.
Scar of the seed, 126. *Leaf-scars*, 27, 28.
Scarious or *Scariose*, thin, dry, and membranous.
Scion, a shoot or slip used for grafting.
Scleros, Greek for hard, hence *Sclerocarpous*, hard-fruited.
Scobiform, resembling sawdust.
Scorpioid or *Scorpioidal*, curved or circinate at the end, 77.
Scrobiculate, pitted; excavated into shallow pits.
Scurf, *Scurfiness*, minute scales on the surface of many leaves, as of Goosefoot.
Scutate, *Scutiform*, buckler-shaped.
Scutellate, or *Scutelliform*, saucer-shaped or platter-shaped.
Secund, one-sided; i. e. where flowers, leaves, &c., are all turned to one side.
Secundine, the inner coat of the ovule, 110.
Seed, 125. *Seed-leaves*, see *cotyledons*. *Seed-vessel*, 127.
Segment, a subdivision or lobe of any cleft body.
Segregate, separated from each other.
Semi-, in compound words of Latin origin, half; as
Semi-adherent, as the calyx or ovary of Purslane; *Semicordate*, half-heart-shaped; *Semilunar*, like a half-moon; *Semiovate*, half-ovate, &c.
Seminal, relating to the seed (*Semen*). *Seminiferous*, seed-bearing.
*Semperviren*t, evergreen.
Sensitiveness in plants, 149, 152.
Senary, in sixes.
Sepal, a leaf or division of the calyx, 14, 79.
Sepaloid, sepal-like. *Sepaline*, relating to the sepals.
Separated Flowers, those having stamens or pistils only, 85.
Septate, divided by partitions.
Septenate, with parts in sevens.
Septicidal, where dehiscence is through the partitions, 123.
Septiferous, bearing the partition.
Septifragal, where the valves in dehiscence break away from the partitions, 123.
Septum (plural *septa*), a partition or dissepiment.
Serial, or *Seriate*, in rows; as *biserial*, in two rows, &c.
Sericeous, silky; clothed with satiny pubescence.
Serotinous, late in the season.
Serrate, the margin cut into teeth (*Serratures*) pointing forwards, 55.
Serrulate, same as the last, but with fine teeth.
Sessile, sitting; without any stalk.
Sesqui-, Latin for one and a half; so *Sesquipedalis*, a foot and a half long.
Seta, a bristle, or a slender body or appendage resembling a bristle.
Setaceous, bristle-like. *Setiform*, bristle-shaped.
Setigerous, bearing bristles. *Setose*, beset with bristles or bristly hairs.
Setula, a diminutive bristle. *Setulose*, provided with such.
Sex, six. *Sexangular*, six-angled. *Sexfarious*, six-faced.
Sheath, the base of such leaves as those of Grasses, which are
Sheathing, wrapped round the stem.
Shield-shaped, same as *scutate*, or as *peltate*, 53.

Shrub, Shrubby, 39.
Sieve-cells, 140.
Sigmoid, curved in two directions, like the letter S, or the Greek *sigma*.
Silicle, a pouch, or short pod of the Cress Family, 123.
Siliculose, bearing a silicle, or a fruit resembling it.
Silique, capsule of the Cress Family, 123.
Siliquose, bearing siliques or pods which resemble siliques.
Silky, glossy with a coat of fine and soft, close-pressed, straight hairs.
Silver-grain, the medullary rays of wood, 139.
Silvery, shining white or bluish-gray, usually from a silky pubescence.
Simple, of one piece; opposed to *compound*.
Sinistrorse, turned to the left.
Sinuate, with margin alternately bowed inwards and outwards, 55.
Sinus, a recess or bay; the re-entering angle between two lobes or projections.
Sleep of Plants (so called), 151.
Smooth, properly speaking not rough, but often used for glabrous, i. e. not pubescent.
Soboliferous, bearing shoots (*Soboles*) from near the ground.
Solitary, single; not associated with others.
Sordid, dull or dirty in hue.
Sorediate, bearing patches on the surface.
Sorosis, name of a multiple fruit, like a pine-apple.
Sorus, a fruit-dot of Ferns, 159.
Spadiceous, chestnut-colored. Also spadix-bearing.
Spadix, a fleshy spike of flowers, 75.
Span, the distance between the tip of the thumb and of little finger outstretched, six or seven inches.
Spathaceous, resembling or furnished with a
Spathe, a bract which inwraps an inflorescence, 75.
Spatulate, or *Spathulate*, shaped like a spatula, 52.
Species, 175.
Specific Names, 179.
Specimens, 184.
Spermaphore, or *Spermophore*, one of the names of the placenta.
Spermum, Latin form of Greek word for seed; much used in composition.
Spica, Latin for spike; hence *Spicate*, in a spike, *Spiciform*, in shape resembling a spike.
Spike, an inflorescence like a raceme, only the flowers are sessile, 74.
Spikelet, a small or a secondary spike; the inflorescence of Grasses.
Spine, 41, 64.
Spindle-shaped, tapering to each end, like a radish, 36.
Spinescent, tipped by or degenerating into a thorn.
Spinose, or *Spiniferous*, thorny.
Spiral Vessels or *ducts*, 135.
Spithameous, span-high.
Spora, Greek name for seed, used in compound words.
Sporadic, widely dispersed.
Sporangium, a spore-case in Ferns, &c., 158.
Spore, a body resulting from the fructification of Cryptogamous plants, in them the analogue of a seed.
Spore-case (*Sporangium*), 158.
Sporocarp, 162.
Sport, a newly appeared variation, 176.
Sporule, same as a spore, or a small spore.
Spumescent, appearing like froth.
Spur, any projecting appendage of the flower, looking like a spur but hollow, as that of Larkspur, fig. 239.
Squamate, Squamose, or *Squamaceous*, furnished with scales (*squamæ*).

Squamellate, or *Squamulose*, furnished with little scales (*Squamellæ*, or *Squamulæ*).
Squamiform, shaped like a scale.
Squarrose, where scales, leaves, or any appendages spread widely from the axis on which they are thickly set.
Squarrulose, diminutive of *squarrose;* slightly squarrose.
Stachys, Greek for spike.
Stalk, the stem, petiole, peduncle, &c., as the case may be.
Stamen, 14, 80, 98.
Staminate, furnished with stamens, 86. *Stamineal*, relating to the stamens.
Staminodium, an abortive stamen, or other body in place of a stamen.
Standard, the upper petal of a papilionaceous corolla, 92.
Starch, 136, 163.
Station, the particular kind of situation in which a plant naturally occurs.
Stellate, *Stellular*, starry or star-like; where several similar parts spread out from a common centre, like a star.
Stem, 39. *Stemlet*, diminutive stem.
Stemless, destitute or apparently destitute of stem.
Stenos, Greek for narrow; hence *Stenophyllous*, narrow-leaved, &c.
Sterile, barren or imperfect.
Stigma, the part of the pistil which receives the pollen, 14, 80, 105.
Stigmatic, or *Stigmatose*, belonging to the stigma.
Stipe (Latin *Stipes*), the stalk of a pistil, &c., when it has any, 112; also of a Fern, 158, and of a Mushroom, 172.
Stipel, a stipule of a leaflet, as of the Bean, &c.
Stipellate, furnished with stipels, as in the Bean tribe.
Stipitate, furnished with a stipe.
Stipulaceous, belonging to stipules. *Stipulate*, furnished with stipules.
Stipules, the appendages one each side of the base of certain leaves, 66.
Stirps (plural, *stirpes*), Latin for race.
Stock, used for race or source. Also for any root-like base from which the herb grows up.
Stole, or *Stolon*, a trailing or reclined and rooting shoot, 40.
Stoloniferous, producing stolons.
Stomate (Latin *Stoma*, plural *Stomata*), the breathing-pores of leaves, 144.
Stone-fruit, 119.
Storage-leaves, 62.
Stramineous, straw-like, or straw-colored.
Strap-shaped, long, flat, and narrow.
Striate, or *Striated*, marked with slender longitudinal grooves or stripes.
Strict, close and narrow; straight and narrow.
Strigillose, *Strigose*, beset with stout and appressed, stiff or rigid bristles.
Strobilaceous, relating to or resembling a
Strobile, a multiple fruit in the form of a cone or head, 124.
Strombuliform, twisted, like a spiral shell.
Strophiole, same as *caruncle*, 126. *Strophiolate*, furnished with a strophiole.
Struma, a wen; a swelling or protuberance of any organ.
Strumose, bearing a struma.
Stupose, like tow.
Style, a stalk between ovary and stigma, 14, 80, 105.
Styliferous, *Stylose*, bearing styles or conspicuous ones.
Stylopodium, an epigynous disk, or an enlargement at the base of the style.
Sub-, as a prefix, about, nearly, somewhat; as *Subcordate*, slightly cordate; *Subserrate*, slightly serrate; *Subaxillary*, just beneath the axil, &c.
Subclass, *Suborder*, *Subtribe*, 178.
Suberose, corky or cork-like in texture.
Subulate, awl-shaped; tapering from a broadish or thickish base to a sharp point.
Succise, as if cut off at lower end.
Succubous, when crowded leaves are each covered by base of next above.

Suckers, shoots from subterranean branches, 39.
Suffrutescent, slightly shrubby or woody at the base only, 39.
Suffruticose, rather more than suffrutescent, 37, 39.
Sulcate, grooved longitudinally with deep furrows.
Superior, above, 96; sometimes equivalent to posterior, 96.
Supernumerary Buds, 30, 31.
Supervolute, plaited and convolute in bud, 97.
Supine, lying flat, with face upward.
Supra-axillary, borne above the axil, as some buds, 31.
Supra-decompound, many times compounded or divided.
Surculose, producing suckers (*Surculi*) or shoots resembling them.
Suspended, hanging down. Suspended ovules or seeds hang from the very summit of the cell which contains them.
Sutural, belonging or relating to a suture.
Suture, the line of junction of contiguous parts grown together, 106.
Sword-shaped, applied to narrow leaves, with acute parallel edges, tapering above.
Syconium, the fig-fruit, 124.
Sylvestrine, growing in woods.
Symmetrical Flower, similar in the number of parts of each set, 82.
Sympetalous, same as gamopetalous.
Sympode, *Sympodium*, a stem composed of a series of superposed branches in such a way as to imitate a simple axis, as in Grape-vine.
Synantherous or *Syngenesious*, where stamens are united by their anthers, 100.
Syncarpous (fruit or pistil), composed of several carpels consolidated into one.
Synonym, an equivalent superseded name.
Synsepalous, same as gamosepalous.
System (artificial and natural), 182, 183.
Systematic Botany, the study of plants after their kinds, 9.

Tabescent, wasting or shrivelling.
Tail, any long and slender prolongation of an organ.
Taper-pointed, same as acuminate, 54.
Tap-root, a root with a stout tapering body, 32–35.
Tawny, dull yellowish, with a tinge of brown.
Taxonomy, the part of botany which treats of classification.
Tegmen, a name for the inner seed-coat.
Tendril, a thread-shaped organ used for climbing, 40.
Terete, long and round; same as *cylindrical*, only it may taper.
Terminal, borne at, or belonging to, the extremity or summit.
Terminology treats of technical terms; same as *Glossology*, 181.
Ternate, *Ternately*, in threes.
Tessellate, in checker-work.
Testa, the outer (and usually the harder) coat or shell of the seed, 125.
Testaceous, the color of unglazed pottery.
Tetra- (in words of Greek composition), four; as, *Tetracoccous*, of four cocci.
Tetradynamous, where a flower has six stamens, two shorter than the four, 101.
Tetragonal, four-angled. *Tetragynous*, with four pistils or styles. *Tetramerous*, with its parts or sets in fours. *Tetrandrous*, with four stamens, 100.
Tetraspore, a quadruple spore, 169.
Thalamaflorous, with petals and stamens inserted on the torus or *Thalamus*.
Thallophyta, *Thallophytes*, 165.
Thallus, a stratum, in place of stem and leaves, 165.
Theca, a case; the cells or lobes of the anther.
Thecaphore, the stipe of a carpel, 113.
Thorn, an indurated pointed branch, 41, 42.
Thread-shaped, slender and round or roundish, like a thread.
Throat, the opening or gorge of a monopetalous corolla, &c., where the border and the tube join, and a little below, 89.

Thyrse or *Thyrsus*, a compact and pyramidal panicle of cymes or cymules, 79.
Tomentose, clothed with matted woolly hairs (*tomentum*).
Tongue-shaped, long and flat, but thickish and blunt.
Toothed, furnished with teeth or short projections of any sort on the margin; used especially when these are sharp, like saw-teeth, and do not point forwards, 55.
Top-shaped, shaped like a top, or a cone with apex downwards.
Torose, *Torulose*, knobby; where a cylindrical body is swollen at intervals.
Torus, the receptacle of the flower, 81, 112.
Trachea, a spiral duct.
Trachys, Greek for rough; used in compounds, as, *Trachyspermous*, rough-seeded.
Transverse, across, standing right and left instead of fore and aft.
Tri- (in composition), three; as,
Triadelphous, stamens united by their filaments into three bundles, 99.
Triandrous, where the flower has three stamens, 112.
Tribe, 178.
Trichome, of the nature of hair or pubescence.
Trichotomous, three-forked. *Tricoccous*, of three cocci or roundish carpels.
Tricolor, having three colors. *Tricostate*, having three ribs.
Tricuspidate, three-pointed. *Tridentate*, three-toothed.
Triennial, lasting for three years.
Trifarious, in three vertical rows; looking three ways.
Trifid, three-cleft, 56.
Trifoliate, three-leaved. *Trifoliolate*, of three leaflets.
Trifurcate, three-forked. *Trigonous*, three-angled, or triangular.
Trigynous, with three pistils or styles, 116. *Trijugate*, in three pairs (*jugi*).
Trilobed or *Trilobate*, three-lobed, 55.
Trilocular, three-celled, as the pistils or pods in fig. 328–330.
Trimerous, with its parts in threes. *Trimorphism*, 117. *Trimorphic* or *Trimorphous*, in three forms.
Trinervate, three-nerved, or with three slender ribs.
Triœcious, where there are three sorts of flowers on the same or different individuals, as in Red Maple. A form of Polygamous.
Tripartible, separable into three pieces. *Tripartite*, three-parted, 55.
Tripetalous, having three petals.
Triphyllous, three-leaved; composed of three pieces.
Tripinnate, thrice pinnate, 59. *Tripinnatifid*, thrice pinnately cleft, 57.
Triple-ribbed, *Triple-nerved*, &c., where a midrib branches into three, near the base of the leaf.
Triquetrous, sharply three-angled; and especially with the sides concave, like a bayonet.
Triserial, or *Triseriate*, in three rows, under each other.
Tristichous, in three longitudinal or perpendicular ranks.
Tristigmatic, or *Tristigmatose*, having three stigmas.
Trisulcate, three-grooved.
Triternate, three times ternate, 59.
Trivial Name, the specific name.
Trochlear, pulley-shaped.
Trumpet-shaped, tubular; enlarged at or towards the summit.
Truncate, as if cut off at the top.
Trunk, the main stem or general body of a stem or tree.
Tube (of corolla, &c.), 89.
Tuber, a thickened portion of a subterranean stem or branch, provided with eyes (buds) on the sides, 44.
Tubercle, a small excrescence.
Tubercled, or *Tuberculate*, bearing excrescences or pimples.
Tubæform, trumpet-shaped.
Tuberous, resembling a tuber. *Tuberiferous*, bearing tubers.
Tubular, hollow and of an elongated form; hollowed like a pipe, 91.

Tubuliflorous, bearing only tubular flowers.
Tunicate, coated; invested with layers, as an onion, 46.
Turbinate, top-shaped.
Turio (plural *turiones*), strong young shoots or suckers springing out of the ground; as Asparagus-shoots.
Turnip-shaped, broader than high, abruptly narrowed below, 35.
Twining, ascending by coiling round a support, 39.
Type, the ideal pattern, 10.
Typical, well exemplifying the characteristics of a species, genus, &c.

Uliginose, growing in swamps.
Umbel, the umbrella-like form of inflorescence, 74.
Umbellate, in umbels. *Umbelliferous*, bearing umbels.
Umbellet (*umbellula*), a secondary or partial umbel, 76.
Umbilicate, depressed in the centre, like the ends of an apple; with a navel.
Umbonate, bossed; furnished with a low, rounded projection like a boss (*umbo*).
Umbraculiform, umbrella-shaped.
Unarmed, destitute of spines, prickles, and the like.
Uncial, an inch (*uncia*) in length.
Uncinate, or *Uncate*, hook-shaped; hooked over at the end.
Under-shrub, partially shrubby, or a very low shrub.
Undulate, or *Undate*, wavy, or wavy-margined, 55.
Unequally pinnate, pinnate with an odd number of leaflets, 65.
Unguiculate, furnished with a claw (*unguis*), 91.
Uni-, in compound words, one; as *Unicellular*, one-celled.
Uniflorous, one-flowered. *Unifoliate*, one-leaved.
Unifoliolate, of one leaflet, 59. *Unijugate*, of one pair.
Unilabiate, one-lipped. *Unilateral*, one-sided.
Unilocular, one-celled. *Uniovulate*, having only one ovule.
Uniserial, in one horizontal row.
Unisexual, having stamens or pistils only, 85.
Univalved, a pod of only one piece after dehiscence.
Unsymmetrical Flowers, 86.
Urceolate, urn-shaped.
Utricle, a small thin-walled, one-seeded fruit, as of Goosefoot, 121.
Utricular, like a small bladder.

Vaginate, sheathed, surrounded by a sheath (*vagina*).
Valve, one of the pieces (or doors) into which a dehiscent pod, or any similar body, splits, 122, 123.
Valvate, *Valvular*, opening by valves. *Valvate*, in æstivation, 97.
Variety, 176.
Vascular, containing vessels, or consisting of vessels or ducts, 134.
Vascular Cryptogams, 156.
Vaulted, arched; same as *fornicate*.
Vegetable Life, &c., 128. *Vegetable anatomy*, 129.
Veins, the small ribs or branches of the framework of leaves, &c., 49, 50.
Veined, *Veiny*, furnished with evident veins. *Veinless*, destitute of veins.
Veinlets, the smaller ramifications of veins, 50.
Velate, furnished with a veil.
Velutinous, velvety to the touch.
Venation, the veining of leaves, &c., 50.
Venenate, poisonous.
Venose, veiny; furnished with conspicuous veins.
Ventral, belonging to that side of a simple pistil, or other organ, which looks towards the axis or centre of the flower; the opposite of dorsal; as the
Ventral Suture, 106.
Ventricose, inflated or swelled out on one side.

Venulose, furnished with veinlets.
Vermicular, worm-like, shaped like worms.
Vernal, belonging to spring.
Vernation, the arrangement of the leaves in the bud, 71.
Vernicose, the surface appearing as if varnished.
Verrucose, warty; beset with little projections like warts.
Versatile, attached by one point, so that it may swing to and fro, 101.
Vertex, same as *apex*.
Vertical, upright, perpendicular to the horizon, lengthwise.
Verticil, a whorl, 68. *Verticillate*, whorled, 68.
Verticillaster, a false whorl, formed of a pair of opposite cymes.
Vesicular, bladdery.
Vespertine, appearing or expanding at evening.
Vessels, ducts, &c., 134.
Vexillary, *Vexillar*, relating to the
Vexillum, the standard of a papilionaceous flower, 92.
Villose, shaggy with long and soft hairs (*Villosity*).
Vimineous, producing slender twigs, such as those used for wicker-work.
Vine, in the American use, any trailing or climbing stem; as a Grape-vine.
Virescent, *Viridescent*, greenish; turning green.
Virgate, wand-shape; as a long, straight, and slender twig.
Viscous, *Viscid*, having a glutinous surface.
Vitta (plural *vittæ*), the oil-tubes of the fruit of Umbelliferæ.
Vitelline, yellow, of the hue of yolk of egg.
Viviparous, sprouting or germinating while attached to the parent plant.
Voluble, twining; as the stem of Hops and Beans, 39.
Volute, rolled up in any way.

Wavy, the surface or margin alternately convex and concave, 55.
Waxy, resembling beeswax in texture or appearance.
Wedge-shaped, broad above, tapering by straight lines to a narrow base, 53.
Wheel-shaped, 89.
Whorl, an arrangement of leaves, &c., in circles around the stem.
Whorled, arranged in whorls, 68.
Wing, any membranous expansion. *Wings* of papilionaceous flowers, 92.
Winged, furnished with a wing; as the fruit of Ash and Elm, fig. 300, 301.
Wood, 133, 142. *Woody*, of the texture or consisting of wood.
Woody Fibre, or *Wood-Cells*, 134.
Woolly, clothed with long and entangled soft hairs.
Work in plants, 149, 155.

Xanthos, Greek for yellow, used in compounds; as *Xanthocarpus*, yellow-fruited.

Zygomorphous, said of a flower which can be bisected only in one plane into similar halves.

FIELD, FOREST, AND GARDEN

BOTANY.

Field, Forest, and Garden

BOTANY,

A SIMPLE INTRODUCTION TO THE

COMMON PLANTS OF THE UNITED STATES

EAST OF THE MISSISSIPPI,

BOTH WILD AND CULTIVATED.

By ASA GRAY,

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NEW YORK ·:· CINCINNATI ·:· CHICAGO

AMERICAN BOOK COMPANY

FROM THE PRESS OF
IVISON, BLAKEMAN & COMPANY.

Entered according to act of Congress, in the year 1868, by

ASA GRAY,

in the Clerk's Office of the District Court of the District of Massachusetts

PREFACE.

THIS book is intended to furnish botanical classes and beginners generally with an easier introduction to the plants of this country than is the *Manual*, and one which includes the common cultivated as well as the native species. It is made more concise and simple, 1. by the use of somewhat less technical language; 2. by the omission, as far as possible, of the more recondite and, for the present purpose, less essential characters; and also of most of the obscure, insignificant, or rare plants which students will not be apt to meet with or to examine, or which are quite too difficult for beginners; such as the Sedges, most Grasses, and the crowd of Golden Rods, Asters, Sunflowers, and the like, which require very critical study. On the other hand, this small volume is more comprehensive than the Manual, since it comprises the common herbs, shrubs, and trees of the Southern as well as the Northern and Middle States, and all which are commonly cultivated or planted, for ornament or use, in fields, gardens, pleasure-grounds, or in house-culture, including even the conservatory plants ordinarily met with.

It is very desirable that students should be able to use exotic as well as indigenous plants in analysis; and a scientific acquaintance with the plants and flowers most common around us in garden, field, and green-house, and which so largely contribute to our well-being and enjoyment, would seem to be no less important than in the case of our native plants. If it is worth while so largely to assemble around us ornamental and useful trees, plants, and flowers, it is certainly well to know what they are and what they are like. To students in agricultural schools and colleges this kind of knowledge will be especially important.

One of the main objects of this book is to provide cultivators, gardeners, and amateurs, and all who are fond of plants and flowers, with a simple guide to a knowledge of their botanical names and

structure. There is, I believe, no sufficient work of this kind in the English language, adapted to our needs, and available even to our botanists and botanical teachers, — for whom the only recourse is to a botanical library beyond the reach and means of most of these, and certainly quite beyond the reach of those whose needs I have here endeavored to supply, so far as I could, in this small volume. The great difficulties of the undertaking have been to keep the book within the proper compass, by a rigid exclusion of all extraneous and unnecessary matter, and to determine what plants, both native and exotic, are common enough to demand a place in it, or so uncommon that they may be omitted. It is very unlikely that I can have chosen wisely in all cases and for all parts of the country, and in view of the different requirements of botanical students on the one hand and of practical cultivators on the other, — the latter commonly caring more for made varieties, races, and crosses, than for species, which are the main objects of botanical study. But I have here brought together, within less than 350 pages, brief and plain botanical descriptions or notices of 2,650 species, belonging to 947 genera; and have constructed keys to the natural families, and analyses of their contents, which I hope may enable students, who have well studied the *First Lessons*, to find out the name, main characters, and place of any of them which they will patiently examine in blossom and, when practicable, in fruit also. If the book answers its purpose reasonably well, its shortcomings as regards cultivated plants may be made up hereafter. As to the native plants omitted, they are to be found, and may best be studied, in the *Manual of the Botany of the Northern United States*, and in Chapman's *Flora of the Southern United States*.

This book is designed to be the companion of the *First Lessons in Botany*, which serves as grammar and dictionary; and the two may be bound together into one compact volume, forming a comprehensive *School Botany*.

For the account of the Ferns and the allied families of Cryptogamous Plants I have to record my indebtedness to Professor D. C. Eaton of Yale College. These beautiful plants are now much cultivated by amateurs; and the means here so fully provided for studying them will doubtless be appreciated.

HARVARD UNIVERSITY HERBARIUM,
Cambridge, Massachusetts, August 29, 1868.

*** In revising the sheets for the present impression, many small errors of the press, most of them relating to accentuation, have now been corrected.

January, 1870.

SIGNS AND ABBREVIATIONS.

The Signs and Abbreviations employed in this work are few. The signs are:

① for an annual plant.
② " a biennial plant.
♃ " a perennial plant.

The signs for degrees, minutes, and seconds are used for feet, inches, and lines, the latter twelve to the inch.

Thus 1° means a foot in length or height, &c.; 2′, two inches; 3″, three lines, or a quarter of an inch. The latter sign is seldom used in this work.

The dash between two figures, as "5–10," means from five to ten, &c.

"Fl." stands for flowers or flowering.
"Cult." " for cultivated.
"Nat." " for naturalized.
"N., E., S., W." for North, East, South, and West.

The geographical abbreviations, such as "Eu." for Europe, and the common abbreviations for the names of the States, need no particular explanation.

ANALYTICAL KEY

TO THE

NATURAL ORDERS OR FAMILIES.

Plants producing true flowers and seeds. . . . . SERIES I. PHÆNOGAMOUS OR FLOWERING, p. 33
Not producing flowers, propagated by spores. . . . . SERIES II. CRYPTOGAMOUS OR FLOWERLESS, p. 359

SERIES I. PHÆNOGAMOUS OR FLOWERING PLANTS.

With wood in a circle or in concentric annual circles or layers around a central pith; netted-veined leaves; and parts of the flower mostly in fives or fours. (See p. 33.)
CLASS I. EXOGENOUS OR DICOTYLEDONOUS PLANTS, p. 13

With wood in separate threads scattered through the diameter of the stem, not in a circle, no annual circles or layers; leaves mostly parallel-veined; and parts of the flower almost always in threes, never in fives. (See p. 316.) CLASS II. ENDOGENOUS OR MONOCOTYLEDONOUS PLANTS, p. 13

Class I. EXOGENOUS OR DICOTYLEDONOUS PLANTS.

With pistil of the ordinary sort, the ovules in a closed ovary. (Cotyledons a pair.) . . Subclass I. ANGIOSPERMOUS, p. 33

With both calyx and corolla, the latter of wholly separate petals. . . . . I. POLYPETALOUS DIVISION, p. 14

With both calyx and corolla, the latter united more or less into one piece. . . II. MONOPETALOUS DIVISION, p. 20

Without corolla, i. e. with only one sort of floral envelope, or even none at all. . . III. APETALOUS DIVISION, p. 24

Without proper pistil, the ovules naked on a scale or on the end of a short axis: cotyledons often more than two in a whorl. . . . . Subclass II. GYMNOSPERMOUS, p. 27

Class II. ENDOGENOUS OR MONOCOTYLEDONOUS PLANTS.

With flowers on a spadix or fleshy spike, perianth none or not corolla-like, and no glumes. I. SPADICEOUS DIVISION, p. 28

With flowers not on a spadix, and perianth or part of it more or less corolla-like. . . II. PETALOIDEOUS DIVISION, p. 28

With flowers enveloped by glumes (chaffy bracts), and no manifest perianth. . . . III. GLUMACEOUS DIVISION, p. 30

Series II. CRYPTOGAMOUS OR FLOWERLESS PLANTS.

Having stems with woody matter in them, also in the leaves. . . Class III. ACROGENOUS PLANTS, or ACROGENS, p. 30

(The lower classes, of cellular plants, destitute of woody matter, including Mosses, Lichens, Sea-Weeds, and Fungi, are here omitted.)

I. POLYPETALOUS DIVISION OF EXOGENS.

A. *Stamens more than* 10, *and more than twice the number of the sepals or divisions of the calyx.*

Stamens monadelphous, united with the base of the corolla: anthers kidney-shaped, one-celled. . . . MALLOW FAMILY, 70
Stamens monadelphous at base: anthers two-celled: leaves twice pinnate. . . . . MIMOSA F. 99
Stamens monadelphous at base: anthers two-celled: leaves not pinnate.
Leaves with joint between petiole and blade, which is translucent-dotted. . . . . Citrus, RUE F. 81
Leaves without a joint and not translucent-dotted. . . . . CAMELLIA F. 75
Stamens not monadelphous.
Pistils numerous, but imbricated over each other and cohering in a mass on a long receptacle. . . . MAGNOLIA F. 42
Pistils several immersed in hollows in a top-shaped receptacle. . . . . Nelumbium, WATER-LILY F. 46
Pistils numerous and separate, at least their ovaries, but concealed in a hollow fleshy receptacle,
Which bears sepals or bracts over its surface: leaves simple, opposite. . . . . CALYCANTHUS F. 130
Which is naked and imitates an inferior ovary: leaves alternate, compound. . . . . Rose, ROSE F. 115
Pistils numerous or more than one, separate, on the receptacle.
Stamens borne on the calyx. . . . . ROSE F. 115
Stamens borne on the receptacle.
Leaves centrally peltate: aquatic herb. . . . . Brasenia, WATER-LILY F. 46
Leaves peltate near the margin: woody climber. . . . . MOONSEED F. 44
Leaves not peltate, quite entire: trees or shrubs.
Spicy-anise-scented: petals numerous: seed solitary. . . . . Illicium, MAGNOLIA F. 42
Unpleasantly scented when bruised: petals 6 in 2 ranks: seeds several. . . . . CUSTARD-APPLE F. 43
Leaves not peltate: herbs, or if woody-stemmed the leaves are compound. . . . . CROWFOOT F. 33
Pistil as to ovary one below but 3–several-lobed or horned at the top.
Not fleshy plants: petals unequal, cut or cleft: pod 1-celled, many-seeded. . . . . MIGNONETTE F. 57
Not fleshy: pod several-celled, several-seeded. . . . . Nigella, CROWFOOT F. 33
Fleshy plants: petals equal, narrow, entire . . . . . FIG-MARIGOLD F. 156

Pistil one, completely so as to the ovary, which is

One-celled and with one parietal placenta, or otherwise showing that the pistil is of a single carpel.

Shrubs or trees: leaves twice pinnate or else phyllodia: fruit a pod. . . . . Acacia, PULSE F. 94

Shrubs or trees: leaves simple: stone fruit. . . . . Prunus, ROSE F. 115

Herbs; with 1-flowered 1–2-leaved stems: leaves peltate. . . . . Podophyllum, BARBERRY F. 44

Herbs; with flowers in racemes, &c.: leaves not peltate. . . . . CROWFOOT F. 33

One-celled, with two or more parietal placentæ.

Calyx free from the ovary: stamens on the receptacle.

Leaves punctate with pellucid and dark dots, opposite, entire. . . . . ST. JOHN'S WORT F. 61

Leaves not punctate.

Calyx persistent, of 5 unequal sepals. . . . . ROCK-ROSE F. 60

Calyx deciduous, of 4 sepals: petals 4. . . . . Polanisia, CAPER F. 56

Calyx falling when the corolla opens or before: petals more numerous than the (mostly 2) sepals. POPPY F. 48

Calyx coherent with the ovary.

Fleshy and leafless, often prickly plants. . . . . CACTUS F. 152

Leafy herbs, rough or bristly, the hairs sometimes stinging. . . . . LOASA F. 151

Two–several-celled, or when 1-celled the ovules not parietal.

Leaves punctate with both dark and pellucid dots, opposite: ovary superior. . . . . ST. JOHN'S WORT F. 61

Leaves punctate with pellucid dots, not jointed with their stalk: ovary inferior. . . . . MYRTLE F. 149

Leaves punctate with pellucid dots, alternate, jointed with their stalk: ovary superior. . . . . RUE F. 81

Leaves not punctate with pellucid dots, and

All at the root, in the form of pitchers or tubes. . . . . PITCHER-PLANT F. 47

All at the root, bearing a fly-trap at the end. . . . . SUNDEW F. 59

All from prostrate rootstocks or tubers under water, mostly peltate or rounded, equal-sided. WATER-LILY F. 46

On the rootstock or tuber, or alternate on stems, unequal-sided, succulent: flowers monœcious. BEGONIA F. 161

On herbaceous stems, succulent: pod 1-celled. . . . . PURSLANE F. 69

On woody stems (trees or shrubs), of ordinary conformation.

Stamens on the receptacle, mostly in 5 clusters: calyx valvate in the bud: stipules (often deciduous). LINDEN F. 75

Stamens in 5 clusters, one on the base of each petal: calyx imbricated in the bud: no stipules.
Ovary superior, 5-celled. . . . . CAMELLIA F. 75
Ovary partly inferior, becoming one-celled and one-seeded. . . . . STORAX F. 220
Stamens separate: leaves alternate, mostly with stipules. . . . . PEAR F. 117
Stamens separate: leaves opposite or some of them scattered: no stipules.
Calyx-tube or cup wholly adherent to the 3–5-celled ovary. . . . . SAXIFRAGE F. 131
Calyx-cup extended beyond the free or adherent few–many-celled ovary. . . LOOSESTRIFE F. 149

B. *Stamens not exceeding* 10, *or if so not more than twice the number of the sepals or divisions of the calyx.*

1. *Calyx free from the two or more separate or nearly separate ovaries.*
Woody twiners, with dicœcious flowers, separate stamens opposite as many petals, and few pistils. . . . MOONSEED F. 44
Woody twiners, with monœcious flowers, united stamens, and many pistils in a head, in fruit scattered in a spike. MAGNOLIA F. 42
Tree, with dicœcious or polygamous flowers, pinnate leaves, and few winged fruits. . . . . QUASSIA F. 83
Trees, with dicœcious or herbs with perfect flowers: leaves pinnate, pellucid-dotted, strong-scented or aromatic . . RUE F. 81
Herbs or shrubs: leaves not pellucid-dotted: flowers chiefly perfect.
Succulent or fleshy plants: pistils, petals, and sepals all equal in number. . . . . ORPINE F. 137
Not succulent nor fleshy-thickened.
Stamens inserted on the calyx: leaves alternate. . . . . ROSE F. 115, & SAXIFRAGE F. 131
Stamens inserted on a disk adhering to bottom of the calyx: leaves opposite, compound. Staphylea, SOAPBERRY F. 88
Stamens inserted on the receptacle. . . . . CROWFOOT F. 33
2. *Calyx free from the single (simple or compound) ovary; i. e. ovary superior.*
Stamens of the same number as the petals and opposite them.
Anthers opening by uplifted valves: ovary simple, 1-celled. . . . . BARBERRY F. 44
Anthers opening lengthwise.
Ovary 1-celled, 1-ovuled: styles 5. . . . . LEADWORT F. 222
Ovary 1-celled, with several ovules on a central placenta.
Style and stigma only one: calyx persistent. . . . . PRIMROSE F. 222
Style or stigma cleft or lobed. . . . . PURSLANE F. 69

Ovary 5-celled, with several ovules in each cell. . . . . STERCULIA F. 75
Ovary 2-celled, with a pair of erect ovules in each cell. . . . . VINE F. 85
Ovary 2–4-celled, with one erect ovule in each cell. . . . . BUCKTHORN F. 86

Stamens when of the same number as the petals alternate with them, sometimes more numerous, sometimes fewer.

Leaves punctate with pellucid and dark dots, opposite, entire: calyx persistent. . . . . ST. JOHN'S WORT F. 61
Leaves punctate with large pellucid dots: leaves alternate or compound. . . . . RUE F. 81
Leaves not punctate with pellucid dots.
Ovary simple, as shown by the style, stigma, and single parietal placenta. . . . . PULSE F. 94
Ovary seemingly simple, 1-celled, 1-seeded: style one. . . . . Fumaria, FUMITORY F. 49
Ovary compound, as shown by the number of cells, placentæ, styles, or stigmas.
With 2 parietal placentæ, but 2-celled by a partition between: stamens tetradynamous. . . . MUSTARD F. 51
With 2 parietal placentæ and 1-celled: stamens 6, separate, not tetradynamous. . . . . CAPER F. 56
With 2 parietal placentæ, and 1-celled: stamens 6 in 2 sets. . . . . FUMITORY F. 49
With 3 (rarely 5) parietal placentæ, and 1-celled: stamens not 6.
Stamens inserted on the calyx, or with 5 clusters of gland-tipped stamen-like bodies. . . SAXIFRAGE F. 131
Stamens on the long stalk of the ovary: tendril-climbers. . . . . PASSION-FLOWER F. 157
Stamens on the receptacle.
Flower irregular: style 1. . . . . VIOLET F. 58
Flower regular: styles various.
Styles or their divisions twice as many as the placentæ: leaves glandular-bristly. . . SUNDEW F. 59
Styles as many as the placentæ: leaves awl-shaped or scale-shaped. . . . TAMARISK F. 63
Style and stigma one: stamens 5: leaves coriaceous. . . . . PITTOSPORUM F. 57
Style and stigma one, or sessile stigmas 3: stamens not 5. . . . . ROCK-ROSE F. 60
With one cell, one erect ovule, and 3 styles or stigmas. . . . . CASHEW F. 84
With one cell and many ovules on a central placenta. . . . . PINK F. 63
With two cells and several or many ovules in the centre, but becoming 1-celled.
Stamens 2 or 3 on the receptacle. . . . . WATER-WORT F. 63
Stamens 4–12, on the calyx. . . . . LOOSESTRIFE F. 149

With two cells and a single hanging ovule in each cell.

Flowers irregular: stamens 6 or 8, diadelphous or monadelphous: anthers opening at the apex. POLYGALA F. 92

Flowers regular, with narrow petals: shrubs or trees.

With alternate simple leaves and 4 stamens with anthers. . . . . WITCH-HAZEL F. 140

With opposite leaves and 2 (rarely 3 or 4) stamens. . . . . OLIVE F. 279

With more than two cells, or when only two cells with 2 or more ovules in each cell.

Seeds very numerous in each of the 3–5 cells of the pod: style 1: stamens on the receptacle. . . HEATH F. 210

Seeds numerous, or few on a stalk bursting out of the pod: style 1: stamens on the calyx. LOOSESTRIFE F. 149

Seeds indefinitely numerous: styles 2 or more, or splitting into 2: stamens on the calyx. . SAXIFRAGE F. 131

Seeds several or few, at least the ovules 3–12 in each cell.

Shrubs, with opposite leaves of 3 or 5 leaflets, and a bladdery pod. . . . . BLADDERNUT F. 89

Herbs, with alternate or radical leaves of 3 or more leaflets: flower regular. . Oxalis, } GERANIUM F. 77

Herbs, with simple alternate leaves: flower irregular. . . . . Impatiens, }

Shrubs, with simple leaves: seeds in a pulpy aril. . . . . STAFF-TREE F. 87

Seeds and ovules only one or two in each cell.

Tree, with twice pinnate leaves, and anthers within the tube of united filaments. . . . . MELIA F. 84

Shrubs or herbs, with stamens monadelphous only at base, and aromatic-scented leaves.

Herbs, with alternate leaves, mostly of pungent taste and odor, no tendrils when climbing: stamens separate. . . . . } GERANIUM F. 77

Herbs, with alternate and compound insipid leaves, climbing by a hook or tendril in the flower-cluster. . . . . Cardiospermum, SOAPBERRY F. 88

Herbs (or one species shrubby), with simple and entire scentless leaves, and stamens often slightly monadelphous at the base. . . . . FLAX F. 77

Shrubs or trees: leaves not aromatic-scented: stamens separate.

Leaves simple, not lobed: fruit a small berry. . . . . HOLLY F. 218

Leaves simple, not lobed: fruit a colored pod: seeds in a red pulpy aril. . . . STAFF-TREE F. 87

Leaves simple, palmately-lobed or cleft, opposite. . . . . MAPLE F. 89

Leaves compound, pinnate or digitate. . . . . SOAP-BERRY F. 88

3. *Calyx with tube adherent to the ovary, i. e. ovary inferior.*

Tendril-bearing herbs, with monœcious or diœcious flowers: stamens commonly only 3. . . . . GOURD F. 158

Not tendril-bearing.

Pod many-seeded, 4-celled: anthers 1-celled, opening by a pore: leaves 3-5-ribbed. . . . . MELASTOMA F. 148

Pod or berry many-seeded: anthers 2-celled, opening lengthwise.

Styles 2-5, or one and 2-cleft. . . . . SAXIFRAGE F. 131

Style only one: stigma 2-4-lobed or entire . . . . . EVENING-PRIMROSE F. 141

Pod with 1-4 seeds, and ovary with more than one ovule in each cell, the seed enclosed in a pulpy aril. STAFF-TREE F. 87

Fruit with one seed, and ovary with only one ovule in each cell.

Stamens just as many as the petals and opposite them . . . . . BUCKTHORN F. 86

Stamens as many as the petals and alternate with them, or sometimes twice as many.

Style only one, slender: stigma notched or 4-lobed: calyx with its tube mostly prolonged more or less beyond the ovary: herbs. . . . . EVENING-PRIMROSE F. 141

Style only one, thick: stigmas 5: calyx not at all continued beyond the ovary. . . . . GINSENG F. 166

Style and stigma one: trees or shrubs, or if herbs the head of flowers with corolla-like involucre. DOGWOOD F. 167

Style none: sessile stigmas 4: aquatic herbs. . . . . WATER-MILFOIL F. 140

Styles 2: petals 4: flowers in axillary clusters in late autumn: shrub: pod 2-lobed. . WITCH-HAZEL F. 140

Styles 2-5: petals 5: flowers corymbed: shrub or trees. . . . . PEAR F. 117

Styles 2-5, mostly 5: petals 5: flowers umbelled: fruit berry-like. . . . . GINSENG F. 166

Styles 2: flowers in (mostly compound) umbels: fruit dry, splitting into 2 closed pieces. . . PARSELY F. 162

II. MONOPETALOUS DIVISION OF EXOGENS.

A. *Calyx with its tube adherent to the ovary, i. e. superior, or ovary inferior.*

Flowers collected in a head which is provided with a calyx-like involucre: anthers syngenesious, i. e. united into a tube or ring around the style, only 4 or 5. . . . . COMPOSITE FAMILY, 179

Flowers not involucrate, or when in an involucrate head having the anthers separate.

Tendril-bearing herbs: leaves alternate: flowers monœcious or diœcious. . . . . GOURD F. 158

Not tendril-bearing: flowers commonly perfect, at most polygamous.

Stamens free from the corolla, or at most lightly cohering with its very base.

Flowers irregular: stamens with the 5 anthers and sometimes the filaments also united. . . . LOBELIA F. 208

Flowers regular: herbs, with some milky juice: stamens only as many as the lobes of the corolla. CAMPANULA F. 209

Flowers regular: shrubs, or evergreen and trailing: stamens twice as many as lobes of corolla. WHORTLEBERRY F. 211

Stamens borne on the tube of the corolla and fewer than its lobes, viz.

One to three: ovary sometimes 3-celled, but the fruit only 1-celled and 1-seeded. . . . . VALERIAN F. 177

Four, two of them shorter: ovary 3-celled, but two cells empty: fruit one-seeded. Linnæa, HONEYSUCKLE F. 169

Four, one longer and one shorter pair: ovary one-celled: fruit very many-seeded. . . . . GESNERIA F. 228

Stamens borne on the corolla, twice or more than twice the number of its lobes, more or less monadelphous or 5-adelphous: leaves alternate. . . . . STORAX F. 220

Stamens borne on the tube of the corolla, just as many as its lobes: leaves opposite or whorled.

With stipules, entire. . . . . CINCHONA F. 173

Without stipules, entire, in whorls: ovary 2-celled: fruit twin, 2-seeded . . . . . MADDER F. 173

Without true stipules, often toothed or compound, chiefly opposite: flowers not in a proper head. HONEYSUCKLE F. 169

Without stipules, often toothed or cut: flowers in an involucrate head: ovary 1-celled, 1-seeded. . . TEASEL F. 178

B. *Calyx free from the ovary, i. e. inferior, or ovary superior.*

Corolla more or less irregular.

Stamens 10 or 5, distinct: anthers opening by a hole at the apex of each cell: ovary 5-celled. . . . HEATH FAMILY, 210

Stamens 10, diadelphous or monadelphous: anthers opening lengthwise: ovary 1-celled. . . . . PULSE F. 94

Stamens 8 or 6, diadelphous or monadelphous: anthers opening by a hole at the apex: ovary 2-celled. . . POLYGALA F. 92

Stamens 6, diadelphous: the middle anther of each set 2-celled, the other two 1-celled: ovary 1-celled. . . FUMITORY F. 49

Stamens (with anthers) 5.

Ovary deeply 4-lobed, making 4 seed-like fruits or pieces. . . . . Echium, BORAGE F. 254

Ovary not divided: fruit (mostly a pod) many-seeded.

Calyx urn-shaped, enclosing the pod, which is 2-celled, the top separating as a lid. Hyoscyamus, NIGHTSHADE F. 265

Calyx 5-cleft or 5-parted: pod 2-valved. . . . . Verbascum, &c., FIGWORT F. 229

Stamens (with anthers) 4 or 2.

Ovary 1-celled with a central placenta, bearing several or many seeds: stamens 2. . . . . BLADDERWORT F. 225

Ovary 1-celled with 2 or 4 parietal placentæ: stamens 4, didynamous.

Leafless plants, brownish or yellowish, never green, with scales in place of foliage. . . . BROOM-RAPE F. 228

Leafy plants, with ordinary foliage.

Not climbing: seeds minute, wingless. . . . . GESNERIA F. 228

Climbing: seeds winged. . . . . BIGNONIA F. 226

Ovary 2-celled, many-ovuled: pod containing very many flat and winged seeds: woody climbers or trees. BIGNONIA F. 226

Ovary 4-celled (but stigmas only 2): many flat and wingless large seeds, filled by the embryo: herbs. . SESAMUM F. 227

Ovary 2-celled, many-seeded or few-seeded, the placenta in the axis.

Seeds few or several in each cell, flat and borne on hook-like projections of the placentæ, or globular on a cartilaginous ring: no albumen. . . . . ACANTHUS F. 239

Seeds many or few in each cell, not borne on hooks, &c.: embryo in albumen. . . . . FIGWORT F. 229

Ovary 2–4 celled, rarely 1-celled, with only a single ovule or seed in each cell, not lobed. . . . . VERVAIN F. 241

Ovary 4-parted, making 4 seed-like pieces or nutlets around the single style. . . . . MINT F. 243

Corolla regular.

Stamens more numerous than the divisions of the corolla. Here, from the cohesion of the bases of the petals, some of the following, ranked as polypetalous, may be sought.

Leaves twice pinnate, or else phyllodia: ovary one, simple, 1-celled. . . . . MIMOSA F. 99

Leaves simply compound, of 3 leaflets: ovary 5-celled: stamens 10, monadelphous at the base. Oxalis, GERANIUM F. 77

Leaves simple, in one compound, fleshy, very thick: anthers 2-celled: pistils as many as lobes of the corolla. ORPINE F. 137

Leaves simple or lobed or divided: stamens indefinite, monadelphous: anthers kidney-shaped, 1-celled. . MALLOW F. 70

Leaves simple, not lobed or divided, nor fleshy: anthers 2-celled: pistil compound, more than 1-celled.

Stamens on the receptacle, free or nearly free from the corolla: anthers commonly opening at the end. HEATH F. 210

Stamens on the corolla or mainly so: anthers opening lengthwise: trees or shrubs.

Flowers polygamous or dicœcious: stamens separate: styles 4, each 2-lobed. . . . . EBONY F. 219

Flowers perfect: stamens more or less monadelphous or 5-clustered.

Base of the calyx coherent with base of the ovary. . . . . STORAX F. 220

Calyx wholly free from the ovary. . . . . CAMELLIA F. 75

Stamens (with anthers) as many as the lobes or divisions of the corolla and opposite them.

Styles or stigmas 5: ovary 1-celled: ovule and seed solitary. . . . . LEADWORT F. 222

Style and stigma only one.

Herbs: ovary 1-celled with a central placenta: seeds few or many. . . . . PRIMROSE F. 222

Trees or shrubs: ovary 5-celled: fruit 1–few-seeded: petal-like scales alternate with the anthers. SAPODILLA F. 220

Stamens (with anthers) as many as the lobes or parts of the corolla and alternate with them.

Pistil one and simple, with one parietal placenta: fruit a legume or loment: leaves twice pinnate. . . . MIMOSA F. 99

Pistils as many as the lobes of the corolla, separate: fleshy plants. . . . . ORPINE F. 137

Pistils several or many as to the ovary, or ovaries deeply lobed, the lobes or pieces making so many separate little 1-seeded fruits or akenes, but all around one common style.

Akenes or lobes numerous in a heap or several in a circle. . . . . NOLANA F. 266

Akenes or lobes only 4 around the base of the common style.

Aromatic plants, with opposite leaves. . . . . Mentha, &c., MINT F. 243

Not aromatic, with alternate and commonly rough leaves. . . . . BORAGE F. 254

Pistils 2 as to their ovaries, these making many-seeded pods, but stigmas and often styles also united into one.

Pollen powdery and loose, as in ordinary plants, not in masses. . . . . DOGBANE F. 274

Pollen all in waxy or granular masses, usually 10, and fixed in pairs to 5 glands of the stigma. . MILKWEED F. 276

Pistil one, with a single compound ovary which is not divided nor deeply lobed.

Stamens on the receptacle, or lightly cohering above with what seems to be the corolla:

ovary 1-celled, 1-seeded. . . . . Mirabilis, FOUR-O'CLOCK F. 283

Stamens on the receptacle, or nearly so: ovary 5-celled: pod many-seeded. . . . . HEATH F. 210

Stamens borne on very base of the 4–8-parted corolla: the cells of the ovary just as many, one ovule in each:

no style: berry-like fruit containing as many little stones. . . . . HOLLY F. 218

Stamens plainly borne on the corolla.

Leaves all radical, 1–7-ribbed: flowers in a spike: corolla thin and becoming dry: stamens 4: style and stigma one: pod 2-celled, rarely 3-celled, opening transversely. . . . . PLANTAIN F. 221

Leaves on the stem,

All opposite and entire, their bases or petioles connected by small stipules or a transverse stipular line: ovary and pod 2-celled, several-seeded. . . . . LOGANIA F. 273

All opposite or whorled and entire, without stipules: ovary and pod 1-celled, several–many-seeded: placentæ parietal.

Juice milky: leaves short-petioled. . . . . Allamanda, DOGBANE F. 274

Juice not milky, bitter: stem-leaves sessile. . . . . GENTIAN F. 270

Alternate or some opposite, without stipules: ovary and pod 1-celled with 2 parietal placentæ.

Smooth marsh or water-plants: leaves round-heart-shaped, entire, or of 3 entire leaflets. GENTIAN F. 270

More or less hairy plants: leaves mostly toothed or divided: style 2-cleft. . . WATERLEAF F. 258

Opposite, no stipules: ovary 4-celled, 4-ovuled: stamens 4: style not 3-cleft. . . . . VERVAIN F. 241

Opposite or alternate, simple or compound, without stipules, not twining: ovary and pod 3-celled: stamens 5: style 3-cleft at the apex. . . . . } POLEMONIUM F. 260

Alternate, pinnate and tendril-bearing, lowest leaflets imitating leafy stipules. Cobæa. }

Alternate, at least not opposite, without stipules: stamens 5, rarely 4: ovary 2–5-celled.

Four cells of the ovary 1-ovuled: fruit splitting into little nutlets: flower-clusters coiled. HELIOTROPE F. 255

Two or three 2-ovuled or four one-ovuled cells: seeds large: mostly twiners. . CONVOLVULUS F. 262
Two or rarely more many-ovuled cells: seeds numerous.
Styles 2, or rarely 3, or two-cleft. . . . . WATERLEAF F. 258
Style and stigma only one. . . . . NIGHTSHADE F. 265
Leaves none: leafless parasitic twiners, destitute of green herbage. . . . . DODDER F. 263
Stamens fewer than the lobes or divisions of the corolla,
Four, mostly didynamous.
Ovary 2-celled, with usually many ovules in each cell. . . . . FIGWORT F. 229
Ovary 2-celled, with few or several ovules in each cell: seeds flat, on hooks. . . . . ACANTHUS F. 239
Ovary 2–4-celled, with a single ovule in each cell. . . . . VERVAIN F. 241
Two only with anthers, and two abortive ones: ovary deeply 4-lobed. . . . . Lycopus, MINT F. 243
Two, exserted: herbs, or some exotic species are low shrubby plants. . . . . Veronica, FIGWORT F. 229
Two, occasionally three: shrubs, trees, or woody twiners. . . . . OLIVE F. 279

III. APETALOUS DIVISION OF EXOGENS.

A. *Flowers not in catkins.*

Ovary 2–6-celled, its cells containing numerous ovules.
Six-celled, the tube of the calyx coherent with its surface or the lower part of it: lobes of the calyx 3. . . BIRTHWORT F. 282
Four-celled, the tube of calyx coherent with its surface: lobes of calyx and stamens 4. Ludwigia, EVENING PRIMROSE F. 141
Five-celled, five-horned, free from the calyx: stamens 10. . . . . Penthorum, ORPINE F. 137
Three-celled, free from the calyx of 5 sepals white inside: stamens 3. . . . . Mollugo, PINK F. 63
Two-celled or four-celled, free from but enclosed in the cup-shaped calyx: stamens 4. . Ammannia, LOOSESTRIFE F. 149
Two-celled, many pistils in a head: no calyx: flowers monœcious. Tree. . . Liquidambar, WITCH-HAZEL F. 140
Ovary 1–2-celled, several-ovuled on one side of a basal placenta. . . . . Cuphea, LOOSESTRIFE F. 149

Ovary or ovaries one-celled, with numerous or several ovules, on parietal placentæ.
- Calyx coherent: placentæ 2. . . . . Chrysosplenium, SAXIFRAGE F. 131
- Calyx free, of 2 sepals: placentæ 2. . . . . Bocconia, POPPY F. 48
- Calyx free, of 4 or more sepals: placentæ 1. . . . . CROWFOOT F. 33

Ovary one-celled, with several or many ovules from the bottom or on a central placenta, free from the calyx.
- Flowers surrounded by dry scarious or colored bracts: pod opening by a transverse line above the base. . . AMARANTH F. 286
- Flowers without colored bracts: pod splitting from the top. . . . . CHICKWEED F. 64

Ovary or separate ovaries one-celled, with one or sometimes two or three ovules.
- Woody plants, parasitic on trees, diœcious. . . . . MISTLETOE F. 292
- Woody or partly woody climbers by their leafstalks. . . . . Clematis, CROWFOOT F. 33
- Trees or shrubs, not climbing.
  - Leaves pinnate, aromatic, their stalks mostly prickly: pistils more than one. . . . . Zanthoxylum, RUE F. 81
  - Leaves pinnate, not aromatic nor prickly: pistil one. . . . . Fraxinus, OLIVE F. 279
  - Leaves simple, beset with silvery (rarely coppery) scurf or scurfy down. . . . . OLEASTER F. 292
  - Leaves simple, not silvery-scurfy,
    - Aromatic or spicy-tasted: calyx mostly corolla-like: anthers opening by uplifted valves. . . . LAUREL F. 290
    - Aromatic-scented: no proper calyx: anthers not opening by valves. . . . . SWEET-GALE F. 305
    - Not aromatic: juice milky: stipules deciduous: flowers in a closed receptacle, which becomes pulpy. . Fig, FIG F. 296
    - Not aromatic, and juice not milky: the leaves
      - Palmately lobed and veined, with sheathing stipules: no evident calyx. . . . . PLANE-TREE F. 300
      - Mostly toothed, feather-veined, sometimes also with ribs from the base: calyx free from the ovary. . ELM F. 296
      - Entire: calyx corolla-like and free from the ovary: flowers perfect. . . . . MEZEREUM F. 291
      - Entire (rarely toothed): tube of calyx coherent with ovary: flowers diœciously polygamous
        - Ovary and fruit pear-shaped: stigma terminal . . . . . SANDALWOOD F. 292
        - Ovary globular or oval: stigma running down one side of the awl-shaped style. . Nyssa, DOGWOOD F. 167
- Herbs, with sheathing stipules above the tumid joints of the stem: leaves alternate. . . . . BUCKWHEAT F. 287
- Herbs, with the stipules if any not in the form of sheaths.
  - Pistils numerous or several: calyx commonly corolla-like: stipules none. . . . . CROWFOOT F. 33

Pistils 3 or 4 : calyx as well as corolla none : flowers perfect, in a spike. . . . . LIZARD'S-TAIL F. 293
Pistils 1 – 4, enclosed by the persistent calyx : leaves alternate, pinnate or lobed, with stipules. . Poterium, &c., ROSE F. 115
Pistil only one, with 2 hairy styles or stigmas : leaves palmately compound or cleft : flowers dicœcious. . . HEMP F. 297
Pistil only one : leaves simple.
Calyx corolla-like (white), its tube coherent with the ovary : flowers perfect : leaves alternate. . SANDALWOOD F. 292
Calyx corolla-like, free from the ovary, but the base of its tube hardening and persistent as a covering to the thin akene, making a sort of nut-like fruit : style and stigma simple. . FOUR-O'CLOCK F. 283
Calyx greenish, sometimes colored or corolla like : seed solitary.
Style or stigma one and simple : flowers monœcious or dicœcious. . . . . NETTLE FAMILY, 296
Styles or stigmas 2 or 3, or 2 – 3-cleft : flowers mostly perfect.
Flowers crowded with dry and scarious bracts. . . . . AMARANTH F. 286
Flowers without imbricated and scarious bracts.
Leaves chiefly alternate, often toothed, cleft, or lobed. . . . . GOOSEFOOT F. 284
Leaves opposite, entire. . . . . CHICKWEED F. 64
Calyx none, except as an adherent covering to the ovary, without lobes : aquatic. . . WATER-MILFOIL F. 140
Ovary 2 – 10-celled, with one or two ovules in each cell.
Aquatic herbs, with 3 – 4-celled nut-like little fruits in the axils of the leaves or bracts. . . . . WATER-MILFOIL F. 140
Herbs, shrubs, rarely trees, with monœcious flowers, 3-celled ovary and 3-lobed pod : the ovules and seeds single or a pair hanging from the summit of the cell : juice milky, except in the Box, &c. . . . . SPURGE F. 293
Herbs, with stout hollow stems, perfect flowers, and 10-celled ovary, becoming berry-like. . . . . POKEWEED F. 284
Shrubs or trees, with 2-celled ovary, and winged fruit (samara or key),
Of two keys, joined at their base and winged from the apex. . . . . MAPLE F. 89
Of a single key, winged from the apex or almost all round . leaves pinnate. . . . . Fraxinus, OLIVE F. 279
Of a single key, thin-winged all round : leaves simple. . . . . ELM F. 296
Shrubs or trees with wingless 2 – 4-celled fruit, no milky juice, and
Perfect or sometimes dicœcious flowers : stamens 4 or 5 : seeds erect. . . . . BUCKTHORN F. 86
Perfect flowers : stamens about 24, white : seeds hanging. . . . . Fothergilla, WITCH-HAZEL F. 140

B. *Flowers (all monœcious or diœcious) one or both sorts in catkins or catkin-like heads.*

Twining herb, with sterile flowers panicled, and fertile in a short scaly catkin (strobile). . . . . Humulus, NETTLE F. 296
Parasitic shrub, on trees: fruit a berry. . . . . MISTLETOE F. 292
Trees or shrubs,
With resinous juice, needle-shaped or scale-like leaves, and a cone (strobile) for fruit. . . . . PINE F. 309
With milky or colored juice, sterile flowers in spikes or racemes, and fertile in catkin-like heads or short spikes, forming a fleshy mass in fruit, enclosing the akenes. . . . . FIG F. 296
With colorless juice, often strong-scented resinous-aromatic bark, pinnate leaves, and only sterile flowers in catkins. WALNUT F. 300
With colorless juice and simple leaves.
Both kinds of flowers in short catkins or heads: fruit waxy-coated, berry-like or nut-like: leaves aromatic. SWEET-GALE F. 305
Both kinds of flowers in scaly catkins: the fertile with 2 or 3 flowers, forming winged or sometimes wingless akenes or small keys, under each scale or bract. . . . . BIRCH F. 306
Both kinds of flowers in catkins, diœcious, one under each scale or bract: pod filled with downy-tufted seeds. WILLOW F. 307
Both kinds of flowers in heads, monœcious, without calyx: leaves palmately-lobed.
Fruit of many two-beaked hard pods in a head: stipules deciduous. . . . . WITCH-HAZEL F. 140
Fruit a head of club-shaped hairy-based nutlets: stipules sheathing. . . . . PLANE-TREE F. 300
Both kinds of flowers or commonly only the sterile in catkins: fruit a nut in a scaly cup, or bur, or sac, or leafy-bracted involucre. . . . . OAK F. 301

GYMNOSPERMOUS EXOGENS.

With palm-like columnar trunks or corm-like stock, and pinnate palm-like foliage. . . CYCADACEÆ or CYCAS F. 309
With branching trunks, and simple, mostly needle-shaped, linear, or scale-like entire leaves. . . CONIFERÆ or PINE F. 309

I. SPADICEOUS DIVISION OF ENDOGENS.

Trees or woody plants with simple trunk, caudex, or stock: leaves persistent, long-petioled, fan-shaped and plaited or pinnate: spadix branched: floral envelopes of 3 or 6 parts. . . . . PALM F. 316

Immersed aquatics, branching and leafy. . . . . PONDWEED F. 316

Small or minute free-floating aquatics, with no distinction of stem and foliage. . . . . DUCKWEED F. 316

Reed-like or Flag-like marsh herbs, with linear and sessile nerved leaves.

Flowers naked in the spike or head: no distinct perianth. . . . . CAT-TAIL F. 318

Flowers with a 6-parted perianth. . . . . Acorus, ARUM F. 317

Terrestrial or marsh-plants, with leaves of distinct blade and petiole, the veins netted. . . . . ARUM F. 317

II. PETALOIDEOUS DIVISION OF ENDOGENS.

Pistils more than one, mostly numerous, separate or nearly so: perianth of 3 green sepals and 3 colored petals: leaves mostly netted-veined between the ribs. . . . . WATER-PLANTAIN F. 319

Pistil only one as to the ovary.

Perianth adherent to the ovary, or superior, i. e. ovary inferior.

Flowers dicœcious: stems twining: leaves with distinct petiole and blade, the veins or veinlets netted. . . YAM F. 335

Flowers dicœcious or polygamous: aquatic herbs: flowers from a spathe. . . . . FROG'S-BIT F. 321

Flowers perfect.

Anthers only one or two, borne on or united with the style or stigma: flower irregular. . . . . ORCHIS F. 323

Antner only one, embracing the slender style but not united with it, 2-celled: flower irregular. . . GINGER F. 328

Anther only one, free from the style, one-celled: flower irregular. . . . . ARROWROOT F. 328

Anthers 5 (one abortive filament without any anther): flower somewhat irregular. . . . BANANA F. 328
Anthers 3, turned outwards: filaments either separate or monadelphous. . . . . IRIS F. 332
Anthers 6, all the stamens being perfect.
Epiphytes or air-plants, except the Pine-Apple. . . . . PINE-APPLE F. 329
Terrestrial plants, chiefly from bulbs or corms, some from tubers, fibrous roots, or rootstocks. AMARYLLIS F. 329
Perianth free from the ovary, or very nearly so.
Epiphytes or air-plants, with dry and often scurfy leaves. . . . . Tillandsia, PINE-APPLE F. 329
Aquatic herbs: flowers irregular as to the (corolla-like) perianth or stamens, or both. . . . PICKEREL-WEED F. 322
Terrestrial herbs or sometimes woody plants, not rush-like or grass-like.
Perianth of green sepals and colored petals which are distinctly different.
Styles or sessile stigmas 3, separate: petals 3, not ephemeral: leaves netted-veined. . . Trillium, LILY F. 337
Style and stigma one: petals 3 or 2, ephemeral. . . . . SPIDERWORT F. 350
Perianth with all 6 (in one instance only 4) parts colored alike or nearly so.
Anthers one-celled: plants mostly climbing by tendrils on the petiole. . . . . SMILAX F. 336
Anthers 2-celled. . . . . LILY F. 337
Terrestrial or aquatic rush-like or grass-like plants, with small regular flowers,
Not in a simple scaly-bracted head: perianth glumaceous. . . . . RUSH F. 349
In a simple spike or raceme: flowers bractless, perfect: perianth herbaceous. . . . . ARROW-GRASS F. 319
In a simple scaly-bracted head on a scape: leaves all from the root.
Perianth yellow, the inner divisions or petals with claws: flowers perfect: pod 1-celled, many-seeded, the placentæ parietal. . . . . YELLOW-EYED GRASS F. 351
Perianth white or whitish: flowers monœcious or diœcious: pod 2-3-celled, 2-3-seeded. . . PIPEWORT F. 352

III. GLUMACEOUS DIVISION OF ENDOGENS.

Ovary 3-celled or 1-celled with 3 parietal placentæ, becoming a pod, 3–many-seeded: flowers with a regular perianth of six glumaceous divisions. In structure of the flower most like the Lily Family; but the glumaceous perianth and the herbage imitate this division. . . . . RUSH F. 349

Ovary 1-celled, 1-ovuled, in fruit an akene or grain. True glumaceous plants; the glumes being bracts.

Glumes single, bearing a flower in the axil. . . . . SEDGE F. 352

Glumes in pairs, an outer pair for the spikelet, an inner pair for each flower. . . . . GRASS F. 353

ACROGENOUS CRYPTOGAMOUS PLANTS.

With many-jointed stems and no leaves, except the united scales or teeth that form a sheath or ring at each joint: spore-cases in a terminal head or spike. . . . . HORSETAIL F. 359

With ample leaves often compound, all from a rootstock or trunk, and bearing the minute spore-cases. . . . . FERN F. 360

With scale-shaped, linear, or awl-shaped and wholly simple leaves thickly set on the leafy stems: spore-cases in the axil of some of them. . . . . CLUB-MOSS F. 372

KEY TO THOSE EXOGENS WHICH FROM THEIR FOLIAGE MIGHT PERHAPS BE MISTAKEN FOR ENDOGENS.

Pistils indefinitely numerous : herbs, polypetalous. . . . . Myosurus and some species of Ranunculus, CROWFOOT F. 33

Pistils 3 – 12, separate.

Leaves peltate or round heart-shaped : aquatics, polypetalous. . . . . WATER-LILY F. 46

Leaves heart-shaped : marsh-plants, apetalous, also destitute of calyx. . . . . LIZARD'S-TAIL F. 293

Leaves thick and fleshy : polypetalous or some few monopetalous : flowers completely symmetrical. . . . ORPINE F. 137

Pistil one, but the ovary deeply 3 – 20-lobed or horned and styles separate : leaves thick and fleshy : polypetalous. FIG-MARIGOLD F. 156

Pistil one, the ovary 4-lobed, and sessile stigmas separate : leaves slender : aquatics. . . . . WATER-MILFOIL F. 140

Pistil one : ovary not lobed : polypetalous.

Petals usually very numerous : ovary many-celled, many-seeded : aquatics. . . . . WATER-LILY F. 46

Petals with the sepals usually very numerous : style 1 : ovary 1-celled, many-ovuled : fleshy, leafless plants. . CACTUS F. 152

Petals and styles, also the stamens 5 : ovary 1-celled, one-ovuled. . . . . LEADWORT F. 222

Petals 5 : styles 2 or 3 : ovary 1-celled, many-ovuled, free from the calyx : leaves opposite. . . Dianthus, &c., PINK F. 63

Petals 5 : styles 2 : ovary 2-celled, 2-ovuled : teeth of the calyx on its summit : leaves alternate. Eryngium, &c., PARSELY F. 162

Petals 5 or 4 : style only one, not lobed.

Calyx free from the 1-celled simple ovary : stamens numerous. . . . . Acacias with phyllodia, MIMOSA F. 99

Calyx adherent to the several-celled ovary : stamens 8 or 10. . . . . MELASTOMA F. 148

Pistil only one, both as to ovary and style : monopetalous.

Stamens 5 : style 3-cleft at the apex : pod 3-celled. . . . . POLEMONIUM F. 260

Stamens 4 : style and stigma one : corolla 4-cleft, dry and scarious : pod 2-celled : leaves ribbed. . . . PLANTAIN F. 221

Stamens 8 or 10 : style and stigma one : corolla becoming dry and scarious : leaves narrow. . . . Heaths, HEATH F. 210

Pistil, if it may be so called, an open scale, or none. . . . . GYMNOSPERMS. 309

KEY TO THOSE ENDOGENS WHICH FROM THEIR FOLIAGE MIGHT BE MISTAKEN FOR EXOGENS.

Flowers spiked on a spadix, and with a prominent spathe. . . . . ARUM F. 317
Flowers not on a spadix: pistils several or many: calyx and corolla distinctly different. . . . WATER-PLANTAIN F. 319
Flowers not on a spadix: pistil only one.
Calyx coherent with the ovary: flowers diœcious or polygamous.
Terrestrial plants, twiners: small flowers in racemes, spikes, or panicles. . . . . YAM F. 335
Aquatic plants: flowers from a spathe. . . . . FROG'S-BIT F. 321
Calyx free from the ovary.
Aquatic herbs: flowers more or less irregular, from a sort of spathe. . . . . PICKEREL-WEED F. 322
Terrestrial herbs, not climbing: anthers 2-celled. . . . . Trillium, &c., LILY F. 337
Terrestrial and mostly twining shrubs or herbs, with tendrils on the petiole: anthers one-celled. . . SMILAX F. 336

SERIES I.

FLOWERING OR PHÆNÓGAMOUS PLANTS:

THOSE which fructify by means of stamens and pistils, and produce true seeds.

CLASS I. DICOTYLÉDONOUS OR EXÓGENOUS PLANTS: Distinguished by having the wood or woody matter of the stem all in a circle between pith and bark, and in yearly layers when the stem is more than one year old: also the embryo with a pair of cotyledons or seed leaves (or several in Pines, &c.). Generally known at once by having netted-veined leaves. Parts of the flower seldom in threes, most commonly in fives or fours. See Lessons, p. 139. This class includes all our ordinary trees and shrubs, and the greater part of our herbs.

SUBCLASS I. ANGIOSPERMOUS: including all of the class which have their seeds in a pericarp, or their ovules in a closed ovary, i. e. all except the Pine and Cycas families.

I. POLYPETALOUS DIVISION. Includes the families which have, at least in some species, both calyx and corolla, the latter with their petals separate, i. e. not at all united into one body. Yet some plants of almost all these families have apetalous flowers.

1. RANUNCULACEÆ, CROWFOOT FAMILY.

Not perfectly distinguished by any one or two particular marks, but may be known, on the whole, by having an acrid watery juice (not milky or colored), numerous stamens, and usually more than one pistil, all the parts of the flower separate from each other, and inserted on the receptacle. The bulk of the seed is albumen, the embryo being very small. The plants are herbs, or a few barely shrubby. Many are cultivated for ornament. The following are the common genera, with their chief distinctions.

§ 1. *Sepals valvate or with their edges turned inward in the bud. Petals none or minute. Pistils many, 1-seeded, becoming akenes. Leaves opposite: the plants mostly climbing by their leaf-stalks.*

1. CLEMATIS. Sepals commonly 4, sometimes several, petal-like. Akenes tipped with the persistent style or a part of it.

§ 2. *Sepals imbricated in the bud. Not climbing, nor woody except in* 8 *and one of* 20.

* *Pistils and akenes several or many in a head,* 1*-seeded.*

+– *Petals none: sepals petal-like.*

2. HEPATICA. Involucre close to the flower, exactly imitating a 3-leaved calyx. Sepals 6 or more, oblong, resembling petals. Pistils 12–20. Stemless low perennials, with rounded 3-lobed leaves and 1-flowered scapes.
3. ANEMONE. Involucre of 2 or more opposite or whorled green leaves much below the flower. Sepals 4–20. Pistils very many in a close head (or fewer in one species), forming pointed or tailed akenes.
4. THALICTRUM. Involucre none, and stem-leaves all alternate, except in one species intermediate between this genus and Anemone. Sepals 4 or more. Pistils 4–15, forming several-angled or grooved akenes. Perennials, with small flowers in panicles or umbels, most of them diœcious, and with ternately compound or decompound leaves.

+– +– *Petals and sepals both conspicuous,* 5 *or more. Akenes naked, short-pointed.*

5. ADONIS. Petals and sepals naked, no pit or appendage at the base. Akenes in a head or short spike.
6. MYOSURUS. Sepals with a spur at the base underneath. Petals on a slender claw, which is hollow at its apex. Akenes in a long tail-shaped spike.
7. RANUNCULUS. Sepals naked. Petals with a little pit or a scale on the short claw. Akenes in a head.

* * *Pistils several,* 2*-ovuled, becoming* 1–2*-seeded pods or berries.*

8. ZANTHORHIZA. Sepals 5, deciduous after flowering Petals 5, small, 2-lobed, on a claw. Stamens 5–10. Little pods 1-seeded. Undershrub, with yellow wood and roots.
9. HYDRASTIS. Sepals 3, falling when the flower opens. Petals none. Fruit berry-like. Low perennial.

* * * *Pistils several, few, or one, forming several-seeded pods or rarely berries.*

+– *Sepals* (4 *or* 5) *falling when the flower opens, petal-like. Petals minute, and with claws, or none. Stamens numerous, white. Leaves ternately decompound.*

10. ACTÆA. Pistil only one, becoming a berry. Flowers in a short and thick raceme or cluster.
11. CIMICIFUGA. Pistils 1–8, becoming pods in fruit. Flowers in long racemes.

+– +– *Sepals not falling when the flower opens, in* 15 *and* 20 *persistent even till the fruit matures, in all the others petal-like and deciduous.*

++ *Petals none at all: flowers regular.*

12. CALTHA. Sepals 5–9. Pods several. Leaves simple and undivided, rounded.

++ ++ *Petals* 5 *or more inconspicuous nectar-bearing bodies, very much smaller than the sepals: flower regular.*

13. TROLLIUS. Sepals 5–many. Petals with a little hollow near the base. Pods sessile. Leaves palmately parted and lobed.
14. COPTIS. Sepals 5–7. Petals club-shaped and tubular at the top. Pods raised on slender stalks! Leaves with 3 leaflets.
15. HELLEBORUS. Sepals 5, persistent, enlarging and turning green after flowering! Petals hollow and 2-lipped. Leaves palmately or pedately divided.
16. NIGELLA. Sepals 5. Petals 2-lobed. Pods 3–5 or more united below into one! Annuals, with finely dissected leaves.

++ ++ ++ *Petals large hollow spurs projecting between the sepals: flower regular.*

17. AQUILEGIA. Sepals 5. Pistils about 5, with slender styles, and forming narrow pods. Perennials, with ternately compound or decompound leaves.

++ ++ ++ ++ *Petals* 2 *or* 4, *much smaller than the* 5 *unequal sepals: i. e. the flower irregular and unsymmetrical. Leaves palmately lobed or parted. Pods* 1–5.

18. DELPHINIUM. Upper sepal spurred: the spur enclosing the spurs of the upper pair of petals: lower pair of petals spurless or wanting.
19. ACONITUM. Upper sepals in the form of a hood or helmet, covering the two very long-clawed and peculiar little petals.

++ ++ ++ ++ ++ *Petals large and flat, of ordinary shape. Sepals herbaceous and persistent! Flowers large, regular.*

20. PÆONIA. A fleshy disk surrounds the base of the 2 or more pistils, which form leathery pods in fruit. Seeds large, rather fleshy-coated. Perennials, with compound or decompound leaves: one species shrubby.

1. CLÉMATIS, VIRGIN'S-BOWER. (Ancient Greek name.) ♃ Ornamental climbers, the stalks of their leaves or leaflets clasping the support, and with somewhat woody stems, or a few are erect herbs.

§ 1. *Flowers (in spring) very large and widely open (3′–6′ across), with usually many small petals or petal-like altered stamens: leaflets in threes.*

C. flórida, GREAT-FL. C. Cult. from Japan, not hardy N.; the flower 3′–4′ across, its 6 or more sepals broad-ovate and overlapping each other, white, purplish, or with a purple centre of transformed stamens (var. SIEBÒLDII); leaves often twice compound.

C. pàtens, (also called C. CŒRÙLEA, GRANDIFLÒRA, and various names for varieties.) Cult. from Japan, hardy. Flower 5′–7′ across, with 6–9 or more oblong or lance-shaped sepals, blue, purple, &c.; leaflets simply in threes.

C. verticillàris (or ATRÁGENE AMERICANA), with flowers about 3′ across, of 4 bluish-purple sepals, is rather scarce in rocky woods or ravines N. and in mountainous parts.

§ 2. *Flowers (in summer) pretty large, of only 4 sepals, and no petals whatever, not white, solitary on the naked peduncle as in* § 1.

* *Leaves (except the uppermost) pinnate or of 3 or more leaflets: climbers.*

C. Viticélla, VINE-BOWER C. Cult. from Eu.; a hardy climber, with flower 2′–3′ across; the widely spreading sepals obovate, thin, either purple or blue; akenes with short naked points.

C. gravèolens. HEAVY-SCENTED C. Cult. from Thibet, recently introduced, very hardy; with open yellow flowers 1½′ across, long and feathery tails to the akenes, and sharp-pointed leaflets.

C. Viórna, LEATHER-FLOWERED C. Wild from Penn. and Ohio S., in moist soil; flower of very thick leathery sepals, purple or purplish, 1′ long or more, erect, and with the narrow tips only spreading or recurved; akenes with very feathery tails.

* * *Leaves simple, entire, sessile: low erect herbs: tails feathery.*

C. integrifòlia, ENTIRE-LEAVED C. Cult. from Eu., sparingly. Stem simple; leaves oval or oblong; flower blue, 1′ long.

C. ochroleùca, PALE C. Wild from Staten Island S., but scarce, has ovate silky leaves and a dull silky flower.

§ 3. *Flowers (in summer) small, white, panicled, succeeded by feathery-tailed akenes.*

C. récta, UPRIGHT VIRGIN'S-BOWER. Cult. from Eu. Nearly erect herb, 3°–4° high, with large panicles of white flowers, in early summer; leaves pinnate; leaflets ovate or slightly heart-shaped, pointed, entire.

C. Flámmula, SWEET-SCENTED V. Cult. from Eu. Climbing freely, with copious sweet-scented flowers at midsummer; leaflets 3–5 or more, of various shapes, often lobed or cut.

C. Virginiàna, COMMON WILD V. Climbing high, with dicœcious flowers late in summer; leaflets 3, cut-toothed or lobed.

2. HEPÁTICA, LIVER-LEAF, HEPA'TICA. (Shape of the 3-lobed leaves likened to that of the liver.) Among the earliest spring flowers. ♃ The involucre is so close to the flower and of such size and shape that it is most likely to be mistaken for a calyx, and the colored sepals for petals.

H. tríloba, ROUND-LOBED H. Leaves with 3 broad and rounded lobes, appearing later than the flowers, and lasting over the winter; stalks hairy; flowers blue, purple, or almost white. Woods, common E. Full double-flowered varieties, blue and purple, are cult. from Eu

H. acutíloba, SHARP-LOBED H. Wild from Vermont W.; has pointed lobes to the leaves, sometimes 5 of them, and paler flowers.

3. ANEMÒNE, ANÉMONY, WIND-FLOWER. (Fancifully so named by the Greeks, because growing in windy places, or blossoming at the windy season, it is doubtful which.) ♃ Erect herbs, with all the stem-leaves above and opposite or whorled, forming the involucre or involucels. Peduncles 1-flowered.

§ 1. *Long hairy styles form feathery tails to the akenes, like those of Virgin's-Bower: fl. large, purple, in early spring. The genus* PULSATILLA *of some authors.*

A. Pulsatílla, PASQUE-FLOWER, of Europe. Cult. in some flower-gardens; has the root-leaves finely thrice-pinnately divided or cut; otherwise much like the next.

A. pàtens, var. **Nuttalliàna,** WILD P. On the plains N. W.; the handsome purple or purplish flower (2′ or more across when open) rising from the ground on a low soft-hairy stem (3′–6′ high), with an involucre of many very narrow divisions; the leaves from the root appearing later, and twice or thrice-ternately divided and cut.

§ 2. *Short styles not making long tails, but only naked or hairy tips.*

* *Garden* ANEMONIES, *from S. Eu., with tuberous roots and very large flowers.*

A. coronària, with leaves cut into many fine lobes, and 6 or more broad oval sepals, also

A. horténsis, with leaves less cut into broader wedge-shaped divisions and lobes, and many longer and narrow sepals, — are the originals of the showy, mostly double or semi-double, great-flowered GARDEN ANEMONIES, of all colors, red in the wild state, — not fully hardy, treated like bulbs.

* * *Wild species, smaller-flowered.*

+– *Pistils very many, forming a dense woolly head in fruit: leaves of the involucre long-petioled, compound: flowers of* 5 *small greenish-white sepals, silky beneath: stem* 2°–3° *high.*

A. cylíndrica, LONG-FRUITED A. Involucre several-leaved surrounding several long naked peduncles; fl. late in spring (in dry soil N. & W.), followed by a cylindrical head of fruit.

A. Virginiàna, VIRGINIAN A. Involucre 3-leaved; peduncles formed in succession all summer, the middle or first one naked, the others bearing 2 leaves (involucel) at the middle, from which proceed two more peduncles, and so on: head of fruit oval or oblong. Common in woods and meadows.

+– +– *Pistils fewer, not woolly in fruit: flower* 1′ *or more broad.*

A. Pennsylvánica, PENNSYLVANIAN A. Stem 1° high, bearing an involucre of 3 wedge-shaped 3-cleft and cut sessile leaves, and a naked peduncle, then 2 or 3 peduncles with a pair of smaller leaves at their middle, and so on; fl. white, in summer. (Lessons, fig. 233.) Alluvial ground, N. & W.

A. nemoròsa, WOOD A. Stem 4′–10′ high, bearing an involucre of 3 long-petioled leaves of 3 or 5 leaflets, and a single short-peduncled flower; sepals white, or purple outside. Woodlands, early spring.

4. THALÍCTRUM, MEADOW-RUE. (Old name, of obscure derivation.) The following are the common wild species, in woodlands and low grounds.

§ 1. *Flowers perfect, few, in an umbel: resembling an Anemone: sepals* 5–10.

T. anemonoìdes, RUE-ANEMONE. A very smooth and delicate little plant, growing with Wood Anemone, which it resembles in having no stem-leaves except those that form an involucre around the umbel of white (rarely pinkish) flowers, appearing in early spring; leaflets roundish, 3-lobed at the end, long-stalked; ovaries many-grooved, and with a flat-topped sessile stigma: otherwise it would rank as an Anemone.

§ 2. *Flowers mostly dicœcious and not handsome, small, in loose compound panicles; the* 4 *or* 5 *sepals falling early: stigmas slender: akenes several-grooved and angled: leaves ternately decompound* (Lessons, fig. 161), *all alternate; the uppermost not forming an involucre.*

T. dioìcum, EARLY MEADOW-RUE. Herb glaucous, 1°–2° high; flowers greenish, in early spring; the yellowish linear anthers of the sterile plant hanging on long capillary filaments: leaves all on general petioles. Rocky woods.

T. purpuráscens, PURPLISH M. Later, often a little downy, 2°–4°

high; stem-leaves not raised on a general petiole; flowers greenish and purplish; anthers short-linear, drooping on capillary and upwardly rather thickened filaments.

T. Cornùti, TALL M. Herb 4° – 8° high; stem-leaves not raised on a general petiole; flowers white, in summer; anthers oblong, not drooping; the white filaments thickened upwards. Low or wet ground.

5. ADÒNIS. (The red-flowered species fabled to spring from the blood of Adonis, killed by a wild boar.) Stems leafy; leaves finely much cut into very narrow divisions. Cult. from Europe for ornament.

A. autumnàlis, PHEASANT'S-EYE A. ① Stems near 1° high, it or the branches terminated by a small flower, of 5 – 8 scarlet or crimson petals, commonly dark at their base. Has run wild in Tennessee.

A. vernàlis, SPRING A. ↯ Stems about 6′ high, bearing a large showy flower, of 10 – 20 lanceolate light-yellow petals, in early spring.

6. MYOSÙRUS, MOUSETAIL (which the name means in Greek). ①

M. mínimus. An insignificant little plant, wild or run wild along streams from Illinois S., with a tuft of narrow entire root-leaves, and scapes 1′ – 3′ high, bearing an obscure yellow flower, followed by tail-like spike of fruit of 1′ – 2′ long, in spring and summer.

7. RANÚNCULUS, CROWFOOT, BUTTERCUP. (Latin name for a little frog, and for the Water Crowfoots, living with the frogs.) A large genus of wild plants, except the double-flowered varieties of three species cult. in gardens for ornament. (Lessons, p. 88, fig. 245, and p. 120, fig. 376, 377.)

§ 1. *Aquatic; the leaves all or mostly under water, and repeatedly dissected into many capillary divisions: flowering all summer.*

R. aquátilis, WHITE WATER-CROWFOOT. Capillary leaves collapsing into a tuft when drawn out of the water; petals small, white, or only yellow at the base, where they bear a spot or little pit, but no scale: akenes wrinkled crosswise.

R. divaricàtus, STIFF W. Like the last, but less common; the leaves stiff and rigid enough to keep their shape (spreading in a circular outline) when drawn out of water.

R. multífidus, YELLOW W. Leaves under water much as those of the White Water-Crowfoots, or rather larger; but the bright yellow petals as large as those of Common Buttercups, and, like them, with a little scale at the base. (Formerly named R. PURSHII, &c.)

§ 2. *Terrestrial, many in wet places, but naturally growing with the foliage out of water: petals with the little scale at the base, yellow in all the wild species.*

* *Akenes not prickly nor bristly nor striate on the sides.* ↯

+ SPEARWORT CROWFOOTS; *growing in very wet places, with mostly entire and narrow leaves: fl. all summer.*

R. alismæfòlius. Stems ascending, 1° – 2° high; leaves lanceolate or the lowest oblong; flower fully ½′ in diameter; akenes beaked with a straight and slender style.

R. Flámmula. Smaller than the last, and akenes short-pointed; rare N., but very common along borders of ponds and rivers is the

Var. **réptans,** or CREEPING S, with slender stems creeping a few inches in length; leaves linear or spatulate, seldom 1′ long; flower only ¼′ broad.

+ + SMALL-FLOWERED CROWFOOTS; *in wet or moist places, with upper leaves 3-parted or divided, and very small flowers, the petals shorter or not longer than the calyx: fl. spring and summer.*

R. abortìvus, SMALL-FLOWERED C. Very smooth and slender, 6′ – 2° high; root-leaves rounded, crenate; akenes in a globular head. Shady places, along watercourses.

R. sceleràtus, CURSED C. So called because the juice is very acrid and blistering; stouter than the last and thicker-leaved, equally smooth, even the

root-leaves lobed or cut; akenes in an oblong or cylindrical head. In water or very wet places.

R. recurvàtus, Hook-styled C. Hairy, 1° – 2° high; leaves all 3-cleft and long-petioled, with broad wedge-shaped 2 – 3-lobed divisions; akenes in a globular head, with long recurved styles. Woods.

R. Pennsylvánicus, Bristly C. Bristly hairy, coarse and stout, 2° – 3° high; leaves all 3-divided; the divisions stalked, again 3-cleft, sharply cut and toothed; akenes in an oblong head, tipped with a short straight style. Along streams.

+ – + – + Buttercups or Common Crowfoots, *with bright yellow corolla, about 1′ in diameter, much larger than the calyx; leaves all once and often twice 3 – 5-divided or cleft, usually hairy; head of akenes globular.*

++ *Natives of the country, low or spreading.*

R. fasciculàris, Early B. Low, about 6′ high, without runners, on rocky hills in early spring; root-leaves much divided, somewhat pinnate; petals rather narrow and distant; akenes scarcely edged, slender-beaked.

R. rèpens, Creeping B. Everywhere common in very wet or moist places, flowering in spring and summer; immensely variable; stem soon ascending, sending out some prostrate stems or runners in summer; leaves more coarsely divided and cleft than those of the last; petals obovate; akenes sharp-edged and stout-beaked.

++ ++ *Introduced weeds from Europe, common in fields, &c., especially E.: stem erect: leaves much cut.*

R. bulbòsus, Bulbous B. Stem about 1° high from a solid bulbous base nearly as large as a hickory nut; calyx reflexed when the very bright yellow and showy large corolla expands, in late spring.

R. àcris, Tall B. Stem 2° – 3° high, no bulbous base; calyx only spreading when the lighter yellow corolla expands, in summer. Commoner than the last, except E. A full double-flowered variety is cult. in gardens, forming golden-yellow balls or buttons.

+ – + – + – + Garden Ranunculuses. *Besides the double variety of the last, the choice Double Ranunculuses of the florist come from the two following.*

R. Asiáticus, of the Levant; with 3-parted leaves and flowers nearly 2′ broad, resembling Anemonies, yellow, or of various colors. Not hardy N.

R. aconitifòlius, of Eu., taller, smooth, with 5-parted leaves, and smaller white flowers, the full double called Fair Maids of France.

* * *Akenes striate or ribbed down the sides.* ①

R. Cymbalària, Sea-side Crowfoot. A little plant, of sandy shores of the sea and Great Lakes, &c., smooth, with naked flowering stems 2′ – 6′ high, and long runners; leaves rounded and kidney-shaped, coarsely crenate; flowers small, in summer.

8. ZANTHORHÌZA, SHRUB YELLOW-ROOT. (Name composed of the two Greek words for *yellow* and *root.*) Only one species,

Z. apiifòlia. A shrubby plant, 1° – 2° high, with deep yellow wood and roots (used by the Indians for dyeing), pinnate leaves of about 5 cut-toothed or lobed leaflets, and drooping compound racemes of small dark or dull-purple flowers, in early spring, followed by little 1-seeded pods: grows in damp, shady places along the Alleghanies.

9. HYDRÁSTIS, ORANGE-ROOT, YELLOW PUCCOON. (Name from the Greek, probably meaning that the root or juice of the plant is drastic.) ♃ A single species,

H. Canadénsis. Low, sending up in early spring a rounded 5 – 7-lobed root-leaf, and a stem near 1° high, bearing one or two alternate smaller leaves above, just below the single small flower. The 3 greenish sepals fall from the bud, leaving the many white stamens and little head of pistils; the latter grow pulpy and produce a crimson fruit resembling a raspberry. Rich woods, from New York, W. & S.

10. ACTÆA, BANEBERRY. (The old Greek name of the Elder, from some likeness in the leaves.) ♃ Fl. in spring, ripening the berries late in summer: growing in rich woods. Leaflets of the thrice-ternate leaves ovate, sharply cleft, and cut-toothed.

A. spicàta, var. **rùbra,** Red Baneberry. Flowers in a very short ovate raceme or cluster, on slender pedicels; berries red.

A. álba, White Baneberry. Taller than the other, smoother, and flowering a week or two later, with an oblong raceme; pedicels in fruit very thick, turning red, the berries white.

11. CIMICÍFUGA, BUGBANE. (Latin name, meaning to drive away bugs.) ♃ Like Baneberry, but tall, with very long racemes (1° – 3°), and dry pods instead of berries; fl. in summer.

C. racemòsa, Tall B. or Black Snakeroot. Stem with the long raceme 4° – 8° high; pistil mostly single, with a flat-topped stigma; short pod holding 2 rows of horizontally flattened seeds. Rich woods.

C. Americàna, American B. More slender, only 2° – 4° high; pistils 5, with slender style and minute stigma; pods raised from the receptacle on slender stalks, flattish, containing few scaly-coated seeds. Alleghanies from Penn. S.; fl. late summer.

12. CÁLTHA, MARSH-MARIGOLD. (Old name, from a word meaning *goblet*, of no obvious application.) ♃ One common species, —

C. palústris, Marsh-Marigold, wrongly called Cowslips in the country. Stem 1° – 2° high, bearing one or more rounded or somewhat kidney-shaped entire or crenate leaves, and a few flowers with showy yellow calyx, about 1½′ across; followed by a cluster of many-seeded pods. Marshes, in spring; young plant boiled for "greens."

13. TRÓLLIUS, GLOBE-FLOWER. (Name of obscure meaning.) Flower large, like that of Caltha, but sepals not spreading except in our wild species; a row of small nectary-like petals around the stamens, and the leaves deeply palmately cleft or parted. ♃ Fl. spring.

T. láxus, Wild G. Sepals only 5 or 6, spreading wide open, yellowish or dull greenish-white; petals very small, seeming like abortive stamens. Swamps, N. & W.

T. Europæus, True or Europæan G. Sepals bright yellow (10 – 20) broad and converging into a kind of globe, the flower appearing as if semi-double. Cult. from Eu.

T. Asiáticus, Asiatic G. Like the last, but flower rather more open and deep orange yellow. Cult. from Siberia.

14. CÓPTIS, GOLDTHREAD. (From Greek word to cut, from the divided leaves.) ♃ The only common species is, —

C. trifòlia, Three-leaved G. A delicate little plant, in bogs and damp cold woods N., sending up early in spring single white flowers (smaller than those of Wood Anemony) on slender scapes, followed by slender-stalked leaves of three wedge-shaped leaflets; these become bright-shining in summer, and last over winter. The roots or underground shoots are of long and slender yellow fibres, used as a popular medicine.

15. HELLÉBORUS, HELLEBORE. (Old Greek name, alludes to the poisonous properties.) ♃ European plants, with pedate leaves and pretty large flowers, in early spring.

H. víridis, Green H., has stems near 1° high, bearing 1 or 2 leaves and 2 or 3 pale yellowish-green flowers: run wild in a few places E.

H. níger, Black H., the flower called Christmas Rose (because flowering in warmer parts of England in winter), has single large flowers (2′ – 3′ across, white, turning pinkish, then green), on scapes shorter than the shining evergreen leaves, in earliest spring. Rare in gardens.

16. NIGÉLLA, FENNEL-FLOWER. (Name from the black seeds.) ⓘ Garden plants from Eu. and Orient; with leafy stems, the leaves finely divided, like Fennel; known by having the 5 ovaries united below into one 5-styled pod. Seeds large, blackish, spicy; have been used as a substitute for spice or pepper.

N. Damascèna, COMMON F. or RAGGED-LADY. Flower bluish, rather large, surrounded and overtopped by a finely-divided leafy involucre, like the other leaves; succeeded by a smooth inflated 5-celled pod, in which the lining of the cells separates from the outer part.

N. satìva, NUTMEG-FLOWER. Cult. in some old gardens; has coarser leaves, and smaller rough pods.

17. AQUILÈGIA, COLUMBINE. (From *aquila*, an eagle, the spurs of the petals fancied to resemble talons.) ♃ Well-known, large-flowered ornamental plants: flowers in spring and early summer, usually nodding, so that the spurs ascend.

* *North American species, with long straight spurs to the corolla.*

A. Canadénsis, WILD C. Flowers about 2′ long, scarlet and orange, or light yellow inside, the petals with a very short lip or blade, and stamens projecting. Common on rocks.

A. Skínneri, MEXICAN C., is taller, later, and considerably larger-flowered than the last, the narrower acute sepals usually tinged greenish; otherwise very similar. Cult.

A. cærùlea, LONG-SPURRED C., native of the Rocky Mountains, lately introduced to gardens, and worthy of special attention; has blue and white flowers, the ovate sepals often 1½′, the very slender spurs 2′ long, the blade of the petals (white) half the length of the (mostly blue) sepals, spreading.

* * *Old World species, with hooked or incurved spurs to the corolla.*

A. vulgàris, COMMON GARDEN C. Cult. in all gardens, 1° – 3° high, many-flowered; spurs rather longer than the blade or rest of the petal; pods pubescent. Flowers varying from blue to purple, white, &c., greatly changed by culture, often full double, with spur within spur, sometimes all changed into a rosette of plane petals or sepals.

A. glandulòsa, GLANDULAR C. A more choice species, 6′ – 1° high, with fewer very showy deep blue flowers, the blade of the petals white or white-tipped and twice the length of the short spurs; pods and summit of the plant glandular-pubescent.

A. Sibírica, SIBERIAN C. Equally choice with the last, and like it; but the spurs longer than the mostly white-tipped short blade, as well as the pods, &c. smooth.

18. DELPHÍNIUM, LARKSPUR. (From the Latin name of the dolphin, alluding to the shape of the flower.) The familiar and well-marked flower of this genus is illustrated in Lessons, p. 87, fig. 239–241.

* *Garden annuals from Eu., with only the 2 upper petals, united into one body, one pistil, and leaves finely and much divided: fl. summer and fall.*

D. Consólida, FIELD L. Escaped sparingly into roadsides and fields, flowers scattered on the spreading branches, blue, varying to pink or white; pod smooth.

D. Ajàcis, ROCKET L. More showy, in gardens, and with similar flowers crowded in a long close raceme, and downy pods; spur shorter: some marks on the front of the united petals were fancied to read AIAI = Ajax.

* * *Perennials, with 4 separate petals and 2 – 5, mostly 3 pistils.*

D. grandiflòrum, GREAT-FL. L. of the gardens, from Siberia and China, is 1° – 2° high, with leaves cut into narrower linear divisions; blue flowers, 1½′ or more across, with ample oval sepals, and the 2 lower petals rounded and entire. Various in color, also double-flowered; summer.

D. cheilánthum, of which D. FORMÒSUM, SHOWY L., is one of the various garden forms, also Siberian, is commonly still larger-flowered, deep

blue, with lower petals also entire or nearly so; the mostly downy leaves have fewer and lanceolate or wedge-lanceolate divisions; is now much mixed and crossed with others: summer.

D. azùreum, AZURE L. Wild S. & W., often downy, 1° – 3° high, with narrow linear divisions to the leaves, and a spike-like raceme of rather small, azure, pale-blue, or sometimes white flowers, in spring; sepals and 2-cleft lower petals oblong. Var. with full-double flowers in gardens: summer.

D. tricórne, DWARF WILD L. Open woods from Penn. W. & S.: about 1° high from a branched tuberous root; has broader linear lobes to the leaves, and a loose raceme of few or several rather large showy flowers, deep blue or sometimes white, in spring; sepals and cleft lower petals oblong; pods strongly diverging.

D. exaltàtum, TALL WILD L., is the wild species (from Penn. W. & S.) most resembling the next, 3° – 5° high, but the less handsome flowers and panicled racemes hoary or downy: fl. summer.

D. elàtum, BEE LARKSPUR. Cult. from Eu.: 3° – 6° high, with broad leaves 5 – 7-cleft beyond the middle, and the divisions cut into sharp lobes or teeth; many flowers (in summer) in a long wand-like raceme, blue or purplish; the 2-cleft lower petals prominently yellowish-bearded in the common garden form. There are many varieties and mixtures with other species, some double-flowered.

19. ACONÌTUM, ACONITE, WOLFSBANE, MONKSHOOD. (Ancient name.) ↳ Root thick, tuberous or turnip-shaped, a virulent poison and medicine. Leaves palmately divided or cleft and cut-lobed. Flowers showy: the large upper sepal from its shape is called the *casque* or *helmet*. Under it are two long-stalked queer little bodies which answer for petals. See Lessons, p. 87, fig. 242, 243, 244. The following are all cult. from Eu. for ornament, except the first: fl. summer.

A. uncinàtum, WILD A. or MONKSHOOD. Stem slender, 3° – 5°, erect, but bending over above, as if inclined to climb; leaves cleft or parted into 3 – 5 ovate or wedge-lanceolate cut-toothed lobes; flowers loosely panicled, blue; the roundish helmet nearly as broad as high, its pointed visor turned down. Low grounds, from Penn. S. & W.

A. variegàtum, VARIEGATED A. Erect; leaves divided to the base into rather broad-lobed and cut divisions; flowers in a loose panicle or raceme, blue and often variegated with white or whitish; the helmet considerably higher than wide, its top curved forward, its pointed visor ascending or horizontal.

A. Napéllus, TRUE MONKSHOOD or OFFICINAL ACONITE. Erect, from a turnip-shaped root; leaves divided to the base and then 2 – 3 times cleft into linear lobes; flowers crowded in a close raceme, blue (also a white variety); helmet broad and low.

A. Anthora, a low species, with very finely divided leaves, and crowded yellow flowers, the broad helmet rather high, occurs in some old gardens.

20. PÆÒNIA, PÆONY. (Ancient name, after a Greek physician, *Pæon.*) ↳ Well-known large-flowered ornamental plants, cult. from the Old World. Leaves ternately decompound. Roots thickened below.

* *Herbs, with single-flowered stems, in spring, and downy pods.*

P. officinàlis, COMMON P. Very smooth, and with large coarsely divided green leaves; the great flowers red, white, &c., single or very double.

P. peregrìna, of Eu., in the gardens called P. PARODÓXA, has leaves glaucous and more or less downy beneath, and smaller flowers than the last, rose-red, &c., generally full double, and petals cut and fringed.

P. tenuifòlia, SLENDER-LEAVED P. of Siberia, is low, with early crimson-red flowers, and narrow linear divisions to the leaves.

* * *Herbs, with several-flowered stems, in summer, and smooth pods.*

P. albiflòra, WHITE-FL. or FRAGRANT P., or CHINESE P. Very smooth about 3° high, with bright green foliage, and white or rose-colored, often sweet-scented, rather small flowers, single, also double, and with purple varieties.

* * * *Shrubby: fl. in spring and early summer.*

P. Moùtan, TREE PÆONY, of China. Stems 2°–3° high; leaves pale and glaucous, ample; flowers very large (6′ or more across), white with purple base, or rose-color, single or double; the disk, which in other species is a mere ring, in this forms a thin-fleshy sac or covering, enclosing the 5 or more ovaries, but bursting, and falling away as the pods grow.

2. MAGNOLIACEÆ, MAGNOLIA FAMILY.

Trees or shrubs, with aromatic bitter bark, simple mostly entire alternate leaves, and solitary flowers; the sepals and petals on the receptacle and usually in threes, but together occupying more than two ranks, and imbricated in the bud; pistils and mostly the stamens numerous, the latter with adnate anthers (Lessons, p. 101, fig. 293); and seeds only 1 or 2 in each carpel; the embryo small in albumen.

I. Stipules to the leaves forming the bud-scales, and falling early. Flowers perfect, large. Stamens and pistils many on a long receptacle or axis, the carpels imbricated over each other and cohering into a mass, forming a sort of cone in fruit. These are the characters of the true Magnolia Family, of which we have two genera.

1. LIRIODENDRON. Sepals 3, reflexed. Corolla bell-shaped, of 6 broad greenish-orange petals. Stamens almost equalling the petals, with slender filaments, and long anthers opening outwards. Carpels thin and scale-form, closely packed over each other, dry in fruit, and after ripening separating and falling away from the slender axis; the wing-like portion answering to style; the small seed-bearing cell at the base and indehiscent. Leaf-buds flat: stipules free from the petiole.
2. MAGNOLIA. Sepals 3. Petals 6 or 9. Stamens short, with hardly any filaments: anthers opening inwards. Carpels becoming fleshy in fruit and forming a red or rose-colored cone, each when ripe (in autumn) splitting down the back and discharging 1 or 2 coral-red berry-like seeds, which hang on extensile cobwebby threads. Stipules united with the base of the petiole, falling as the leaves unfold.

II. Stipules none. Here are two Southern plants which have been made the representatives of as many small orders.

3. ILLICIUM. Flowers perfect. Petals 9–30. Stamens many, separate. Pistils several in one row, forming a ring of almost woody little pods.
4. SCHIZANDRA. Flowers monœcious. Petals mostly 6. Stamens 5, united into a disk or button-shaped body, which bears 10 anthers on the edges of the 5 lobes. Pistils many in a head, which lengthens into a spike of scattered red berries.

1. LIRIODÉNDRON, TULIP-TREE (which is the meaning of the botanical name in Greek). Only one species,

L. Tulipífera. A tall, very handsome tree, in rich soil, commonest W., where it, or the light and soft lumber (much used in cabinet-work), is called WHITE-WOOD, and even POPLAR; planted for ornament; fl. late in spring, yellow with greenish and orange. Leaves with 2 short side-lobes, and the end as if cut off.

2. MAGNÒLIA. (Named for the botanist *Magnol.*) Some species are called UMBRELLA-TREES, from the way the leaves are placed on the end of the shoots; others, CUCUMBER-TREES, from the appearance of the young fruit.

* *Native trees of this country, often planted for ornament.*

M. grandiflòra, GREAT-FLOWERED MAGNOLIA of S., half-hardy in the Middle States. The only perfectly evergreen species; splendid tree with

coriaceous oblong or obovate leaves, shining above, mostly rusty beneath; the flowers very fragrant, white, very much larger than the next, in spring.

M. glaùca, SMALL M. or SWEET BAY. Wild in swamps N. to New Jersey and Mass.; a shrub or small tree, with the oblong obtuse leaves white or glaucous beneath, and globular white and fragrant flowers (2′ – 3′ wide), in summer. The leaves are thickish and almost evergreen, quite so far south.

M. acuminàta, CUCUMBER M. or CUCUMBER-TREE. Wild from N. Y. W. & S.; a stately tree, with the leaves thin, green, oblong, acute or pointed at both ends, and somewhat downy beneath, and pale yellowish-green flowers (3′ broad), late in spring.

M. cordàta, YELLOW CUCUMBER M., of Georgia, hardy even in New England; like the last, but a small tree with the leaves ovate or oval, seldom cordate; and the flowers lemon-yellow.

M. macrophýlla, GREAT-LEAVED M., of Carolina, nearly hardy N. to Mass. A small tree, with leaves very large (2° – 3° long), obovate-oblong with a cordate base, downy and white beneath, and an immense open-bellshaped white flower (8′ – 12′ wide when outspread), somewhat fragrant, in early summer; petals ovate, with a purple spot at the base.

M. Umbrélla, UMBRELLA M. (also called M. TRIPÉTALA). Wild in Penn. and southward. A low tree, with the leaves on the end of the flowering branches crowded in an umbrella-like circle, smooth and green both sides, obovate-lanceolate, pointed at both ends, 1° – 2° long, surrounding a large white flower, in spring; the petals 2½′ – 3′ long, obovate-lanceolate and acute, narrowed at the base; the ovate-oblong cone of fruit showy in autumn, rose-red, 4′ – 5′ long.

M. Fràseri, EAR-LEAVED UMBRELLA M. (also called M. AURICULÀTA). Wild from Virginia S., hardy as the last, and like it; but a taller tree, with the leaves seldom 1° long and auricled on each side at the base, the white obovate-spatulate petals more narrowed below into a claw; cone of fruit smaller.

* * *Chinese and Japanese species.*

M. conspícua, YULAN of the Chinese, half-hardy in N. States. A small tree, with very large white flowers appearing before any of the leaves, which are obovate, pointed, and downy when young.

M. Soulangeàna is a hybrid of this with the next, more hardy and the petals tinged with purple.

M. purpùrea, PURPLE M. of Japan, hardy N. A shrub, the showy flowers (pink-purple outside, white within) beginning to appear before the leaves, which are obovate or oval, and bright dark green.

3. ILLÍCIUM, STAR-ANISE. (From a Latin word, meaning *to entice.*) Shrubs, aromatic, especially the bark and pods, with evergreen oblong leaves.

I. anisàtum, of China, which yields an *oil of anise,* has small yellowish flowers, is rare in greenhouses.

I. Floridànum, WILD ANISE-TREE, of Florida, &c.; has larger dark purple flowers, of 20 – 30 narrow petals, in spring.

4. SCHIZÁNDRA. (Name from two Greek words, means *cut-stamens.*)

S. coccínea, a twining shrub of S. States, scarcely at all aromatic, with thin ovate or oblong leaves, and small crimson-purple flowers, in spring.

3. ANONACEÆ, CUSTARD-APPLE FAMILY.

Trees or shrubs, with 3 sepals and 6 petals in two sets, each set valvate in the bud, and many short stamens on the receptacle, surrounding several pistils, which ripen into pulpy fruit containing large and flat bony seeds. Embryo small; the albumen which forms the bulk of the kernel appears as if cut up into small pieces. Foliage and properties resembling Magnolia Family, but seldom aromatic, and no stipules. All tropical, except the single genus

1. ASÍMINA, PAPAW of U. S. (Creole name.) Petals greenish or yellowish, becoming dark dull purple as they enlarge; the 3 inner small. Pistils few in the centre of the globular head of anthers, making one or more large, oblong, pulpy fruits, sweet and eatable when over-ripe in autumn. Flowers in early spring preceding the leaves.

A. tríloba, COMMON PAPAW (wholly different from the true Papaw of W. Ind.), is a shrub or small tree, wild W. & S. and sometimes planted, with obovate-lanceolate leaves, and banana-shaped fruit 3′ – 4′ long.

A. parviflòra is a small-flowered, and **A. grandiflòra** a large-flowered species of S. E. States, both small-fruited, and **A. pygmæa** is a dwarf one with nearly evergreen leaves far South.

4. MENISPERMACEÆ, MOONSEED FAMILY.

Woody or partly woody twiners, with small diœcious flowers; their sepals and petals much alike, and one before the other (usually 6 petals before as many sepals); as many or 2 – 3 times as many stamens; and 2 – 6 pistils, ripening into 1-seeded little stone-fruits or drupes; the stone curved, commonly into a wrinkled or ridged ring; the embryo curved with the stone. Leaves palmate or peltate: no stipules. Anthers commonly 4-lobed.

1. COCCULUS. Sepals, petals, and stamens each 6.
2. MENISPERMUM. Sepals and petals 6 or 8. Stamens in sterile flowers 12 – 20.

1. CÓCCULUS. (Name means a little berry.) Only one species in U. S.

C. Carolìnus, CAROLINA C. Somewhat downy; leaves ovate or heart-shaped, entire or sinuate-lobed; flowers greenish, in summer; fruits red, as large as peas. From Virginia S. & W.

2. MENISPÉRMUM, MOONSEED. (Name from the shape of the stone of the fruit.) Only one species,

M. Canadénse, CANADIAN MOONSEED. Almost smooth; leaves peltate near the edge; flowers white, in late summer; fruits black, looking like small grapes.

5. BERBERIDACEÆ, BARBERRY FAMILY.

Known generally by the perfect flowers, having a petal before each sepal, and a stamen before each petal, with anthers opening by a pair of valves like trap-doors, hinged at the top (Lessons, p. 103, fig. 308), and a single simple pistil. But No. 6 has numerous stamens, 5 and 6 have more petals than sepals, and the anthers of 2 and 6 open lengthwise, in the ordinary way. There are commonly bracts or outer sepals behind the true ones. All blossom in spring, or the true Barberries in early summer.

* *Shrubs or shrubby: stamens* 6 : *berry few-seeded.*

1. BERBERIS. Flowers yellow, in racemes: petals with two deep-colored spots at the base. Leaves simple, or simply pinnate. Wood and inner bark yellow. Leaves with sharp bristly or spiny teeth.
2. NANDINA. Flowers white, in panicles: anthers opening lengthwise. Leaves twice or thrice pinnate.

* * *Perennial herbs.*

+– *With one to three twice or thrice ternately compound leaves.*

3. EPIMEDIUM. Stamens 4. Petals 4 hollow spurs or hoods. Pod several seeded. Leaflets with bristly teeth.

4. CAULOPHYLLUM. Stamens 6. Petals 6 broad and thickish bodies much shorter than the sepals. Ovary bursting or disappearing early, leaving the two ovules to develop into naked berry-like, or rather drupe-like, spherical seeds on thick stalks.

+ + *With simply* 2 – 9*-parted leaves, and solitary white flowers: sepals falling when the blossom opens. Seeds numerous, parietal. Pistils rarely more than one!*

5. JEFFERSONIA. Flower on a scape, rather preceding the 2-parted root-leaves. Petals (oblong) and stamens mostly 8. Fruit an ovate pod, opening by a cross-line half-way round, the top forming a conical lid. Seeds with an aril on one side.

6. PODOPHYLLUM. Flower in the fork between the two peltate 5 – 9-parted leaves: root-leaf single and peltate in the middle, umbrella-like. Petals 6 – 9, large and broad. Stamens usually 12 – 18. Fruit an oval, large and sweet, eatable berry; the seeds imbedded in the pulp of the large parietal placenta.

1. BÉRBERIS, BARBERRY. (Old Arabic name.) The two sorts or sections have sometimes been regarded as distinct genera.

§ 1. True Barberry; *with simple leaves, clustered in the axil of compound spines.*

B. vulgàris, Common B. of Eu. Planted, and run wild in thickets and by roadsides; has drooping many-flowered racemes, and oblong red and sour berries; leaves obovate-oblong, fringed with closely-set bristly teeth, with a joint in the very short petiole (like that in an orange-leaf), clustered in the axils of triple or multiple spines, which answer to leaves of the shoot of the previous season (see Lessons, p. 63, fig. 171).

B. Canadénsis, Wild B. In the Alleghanies from Virginia S., and rarely cult., a low bush, with few-flowered racemes, oval red berries, and less bristly or toothed leaves.

§ 2. Mahonia; *with pinnate and evergreen leaves, spiny-toothed leaflets, and clustered racemes of early spring flowers: berries blue or black with a bloom. Planted for ornament.*

B. Aquifòlium, Holly B. or Mahonia, from Oregon, &c., rises to 3° – 4° high; leaflets 5 – 9, shining, finely reticulated.

B. rèpens, Creeping or Low M., from Rocky Mountains, is more hardy, rises only 1° or less, and has rounder, usually fewer, pale or glaucous leaflets.

B. nervòsa, also called glumàcea, from the husk-like long and pointed bud-scales at the end of the stems, which rise only a few inches above the ground; leaflets 11 – 21, along the strongly-jointed stalk, lance-ovate, several-ribbed from the base. Also from Oregon.

B. Japónica, Japan M., tall, rising fully 6° high, the rigid leaflets with only 3 or 4 strong spiny teeth on each side, is coming into ornamental grounds.

2. NANDÌNA. (The native Japanese name.) A single species, viz.

N. doméstica. Cult. in cool greenhouse, &c., from Japan: very compound large leaves: the berries more ornamental than the blossoms.

3. EPIMÈDIUM, BARREN-WORT. (Old Greek name, of uncertain meaning.) Low herbs, with neat foliage: cult. for ornament.

E. Alpìnum, of European Alps, has a panicle of odd-looking small flowers; the yellow petals not larger than the reddish sepals.

E. macránthum, Large-flowered E. of Japan, with similar foliage, has large white flowers with very long-spurred petals.

4. CAULOPHÝLLUM, COHOSH. The only species of the genus is

C. thalictroìdes, Blue Cohosh. Wild in woods, with usually only one stem-leaf and that close to the top of the naked stem (whence the name of the genus, meaning *stem-leaf*), and thrice ternate, but, having no common petiole, it looks like three leaves; and there is a larger and more compound radical leaf, with a long petiole. The leaves are glaucous and resemble those of *Thalictrum* (as the specific name indicates), but the leaflets are larger. Seeds very hard, with a thin blue pulp.

5. JEFFERSÒNIA, TWIN-LEAF. (Named for *Thomas Jefferson.*)

J. diphýlla, sometimes called RHEUMATISM-ROOT. Wild in rich woods, W. & S., sometimes cult.; the pretty white flower and the leaves both long-stalked, from the ground, appearing in early spring.

6. PODOPHÝLLUM, MAY-APPLE, or MANDRAKE. (Name means *foot-leaf,* the 5 – 7-parted leaf likened to a webbed-foot.)

P. peltàtum. Wild in rich soil: the long running rootstocks (which are poisonous and medicinal) send up in spring some stout stalks terminated by a large, 7 – 9-lobed, regular, umbrella-shaped leaf (i. e. peltate in the middle), and some which bear two one-sided leaves (peltate near their inner edge), with a large white flower nodding in the fork. The sweet pulpy fruit as large as a pullet's egg, ripe in summer: rarely 2 or more to one flower.

6. NYMPHÆACEÆ, WATER-LILY FAMILY.

Aquatic perennial herbs, with the leaves which float on the surface of the water or rise above it mostly peltate or roundish-heart-shaped, their margins inrolled in the bud, long-petioled; axillary 1-flowered peduncles; sepals and petals hardly ever 5, the latter usually numerous and imbricated in many rows. The genera differ so widely in their botanical characters that they must be described separately. One of them is the famous Amazon Water-Lily, VICTORIA REGIA, with floating leaves 3 feet or more in diameter, and the magnificent flowers almost in proportion; while the dull flowers of Water-shield are only half an inch long.

1. BRASENIA. Sepals and petals each 3 or 4, narrow, and much alike, dull purple. Stamens 12 – 18: filaments slender. Pistils 4 – 18, forming indehiscent 1 – 3-seeded pods. All the parts separate and persistent. Ovules commonly on the dorsal suture! Embryo, &c. as in Water-Lily.
2. NELUMBIUM. Sepals and petals many and passing gradually into each other, deciduous. Stamens very many, on the receptacle, the upper part of which is enlarged into a top-shaped body, bearing a dozen or more ovaries, each tipped with a flat stigma and separately immersed in as many hollows. (Lessons, p. 113, fig. 362.) In fruit these form 1-seeded nuts, resembling small acorns. The whole kernel of the seed is embryo, a pair of fleshy and farinaceous cotyledons enclosing a plumule of 2 or 3 rudimentary green leaves.
3. NYMPHÆA. Sepals 4, green outside. Petals numerous, many times 4, passing somewhat gradually into the numerous stamens (Lessons, p. 84, fig. 228): both organs grow attached to the globular many-celled ovary, the former to its sides which they cover, the latter borne on its depressed summit. Around a little knob at the top of the ovary the numerous stigmas radiate as in a poppy-head, ending in long and narrow incurved lobes. Fruit like the ovary enlarged, still covered by the decaying persistent bases of the petals: numerous seeds cover the partitions. Ripe seeds each in an arillus or bag open at the top. (Lessons, p. 126, fig. 418.) Embryo, like that of Nelumbium on a very small scale, but enclosed in a bag, and at the end of the kernel, the rest of which is mealy albumen.
4. NUPHAR. Sepals usually 6 or 5, partly green outside. Petals many small and thickish bodies inserted under the ovary along with the very numerous short stamens. Ovary naked, truncate at the top, which is many-rayed by stigmas, fleshy in fruit: the internal structure as in Nymphæa, only there is no arillus to the seeds.

1. BRASÈNIA, WATER-SHIELD. (Name unexplained.) One species,

B. peltàta. In still, rather deep water: stems rising to the surface, slender, coated with clear jelly, bearing floating oval centrally-peltate leaves (2′ – 3′ long), and purplish small flowers, produced all summer.

2. NELÚMBIUM, NELUMBO. (Ceylonese name.) Rootstocks interrupted and tuberous, sending up, usually out of water, very long petioles and

peduncles, bearing very large (1°–2° wide) and more or less dish-shaped or cup-shaped centrally-peltate entire leaves, and great flowers (5′–10′ broad), in summer. Seeds, also the tubers, eatable.

N. lùteum, YELLOW N. or WATER CHINQUEPIN. Common W. & S.: introduced, by Indians perhaps, at Sodus Bay, N. Y., Lyme, Conn., and below Philadelphia. Flower pale dull yellow: anther hook-tipped.

N. speciòsum, SHOWY N., LOTUS or SACRED BEAN of India, with pinkish flowers and blunter anthers: cult. in choice conservatories.

3. NYMPHÆA, WATER-LILY, POND-LILY. (Dedicated to the Water-Nymphs.) Long prostrate rootstocks, often as thick as one's arm, send up floating leaves (rounded and with a narrow cleft nearly or quite to the petiole) and large handsome flowers, produced all summer: these close in the afternoon: the fruit ripens under water.

N. odoràta, SWEET-SCENTED WHITE W. Common in still or slow water, especially E. Flower richly sweet-scented, white, or sometimes pinkish, rarely pink-red, variable in size, as are the leaves; seeds oblong.

N. tuberòsa, TUBER-BEARING W. Common through the Great Lakes, and W. & S. Flower nearly scentless (its faint odor like that of apples), pure white, usually larger (4′–9′ in diameter), as are also the leaves (8′–15′ wide); petals broader and blunter; seeds almost globular; rootstock bearing copious tubers like "artichokes," attached by a narrow neck and spontaneously separating.

N. cærùlea, BLUE W., of Egypt, &c., cult. in aquaria; a tender species, with crenate-toothed leaves, and blue or bluish sweet-scented flowers, the petals fewer and acute.

4. NÙPHAR, YELLOW POND-LILY, or SPATTER-DOCK. (Old Greek name.) Rootstock, &c. as in Nymphæa: leaves often rising out of water: flowers by no means showy, yellow, sometimes purplish-tinged, produced all summer: fruit ripening above water.

N. ádvena is the common species, everywhere; has 6 unequal sepals or sometimes more; petals, or what answer to them, truncate, shorter than the stamens and resembling them; the thickish leaves rounded or ovate-oblong.

N. lùteum, rare N.; has smaller flowers, with 5 sepals, petals dilated upwards and more conspicuous, and a globular fruit with a narrow neck: the var. **pùmilum,** a small variety, has flowers only 1′, and leaves 1′–5′ in diameter; rather common N.

N. sagittifòlia, ARROW-LEAVED N., from North Carolina S.; has sagittate leaves (1° by 2′), and 6 sepals. This and the last produce their earlier leaves under water and very thin.

7. SARRACENIACEÆ, PITCHER-PLANT FAMILY.

Consists of one South American plant, of the curious DARLINGTONIA CALIFORNICA in the mountains of California, and of the following: —

1. SARRACÈNIA. (Named for *Dr. Sarrasin* of Quebec.) SIDESADDLE-FLOWER, a most unmeaning popular name. Leaves all radical from a perennial root, and in the form of hollow tubes or pitchers, winged down the inner side, open at the top, where there is a sort of arching blade or hood. The whole foliage yellowish green or purplish. Scape tall, naked, bearing a single large nodding flower, in early summer. Sepals 5, with 3 bractlets at the base, colored, persistent. Petals 5, fiddle-shaped, incurved over the peltate and umbrella-shaped 5-angled petal-like great top to the style. Stamens very numerous. Ovary 5-celled. Pod many-seeded, rough-warty.

S. purpùrea, PURPLE S. or PITCHER-PLANT of the North, where it is common in bogs. Leaves pitcher-shaped, open, with an erect round-heart-shaped hood and a broad side-wing, purple-veiny; flower deep purple.

S. rùbra, Red-flowered Trumpet-Leaf of S. States: sometimes cult. in greenhouses. Leaves trumpet-shaped, slender, a foot long, with a narrow wing and an erect ovate pointed hood; flower crimson-purple.

S. Drummóndii, Great Trumpet-Leaf of Florida: sometimes cult. Leaves much like the last, but 2° or 3° long, upper part of the tube and the roundish erect hood variegated and purple-veiny; and the deep-purple flower very large.

S. psittacìna, Parrot Pitcher-Plant of S. States, and rarely cult. Leaves short and spreading, with a narrow tube, a broad wing, and an inflated globular hood, which is incurved over the mouth of the tube, spotted with white; flower purple.

S. variolàris, Spotted Trumpet-Leaf of S. States. Leaves erect, trumpet-shaped, white-spotted above, longer than the scape, with a broad wing, and an ovate hood arching over the orifice; flower yellow.

S. flàva, Yellow Trumpet-Leaf of S. States: cult. more commonly than the rest, as a curiosity, and almost hardy N. Leaves trumpet-shaped, 2° long, erect, yellowish or purple-veiny. with a narrow wing, and an erect roundish but pointed hood, a tall scape, and yellow flower.

8. PAPAVERACEÆ, POPPY FAMILY.

Herbs with milky or colored juice, regular flowers, a calyx mostly of 2 sepals which fall when the blossom opens, petals twice or 3 – 5 times as many, numerous stamens on the receptacle, and a compound 1-celled ovary, with 2 or more parietal placentæ. Fruit a pod, many-seeded. Juice narcotic, as in Poppy (opium), or acrid. No. 5 has watery juice, with the odor of muriatic acid, and the calyx like a cap or lid; No. 7 has no petals and few seeds.

* *Petals crumpled in the flower-bud, which droops on its peduncle before opening.*

1. PAPAVER. Stigmas united into a many-rayed circular body which is closely sessile on the ovary. Pod globular or oblong, imperfectly many-celled by the projecting placentæ which are covered with numberless seeds, opening only by pores or chinks at the top. Juice white.
2. STYLOPHORUM. Stigma 3 – 4-lobed, raised on a style. Pod ovoid, bristly, opening from the top into 3 or 4 valves, leaving the thread-like placentæ between them. Juice yellow.
3. CHELIDONIUM. Stigma 2-lobed, almost sessile. Pod linear, with 2 placentæ, splitting from below into 2 valves. Juice orange.

* * *Petals more or less crumpled in the bud, which is erect before opening.*

4. ARGEMONE. Stigma 3 – 6-lobed, almost sessile. Sepals and oblong pod prickly; the latter opening by valves from the top, leaving the thread-like placentæ between. Juice yellow.
5. ESCHSCHOLTZIA. Sepals united into a pointed cap which falls off entire. Receptacle or end of the flower-stalk dilated into a top-shaped body, often with a spreading rim. Stigmas 4 – 6, spreading, unequal; but the placentæ only 2. Pod long and slender, grooved. Juice colorless.

* * * *Petals not crumpled in the bud, which does not droop.*

6. SANGUINARIA. Sepals 2: but the petals 8 – 12. Stigma 2-lobed, on a short style. Pod oblong, with 2 placentæ. Juice orange-red.

* * * * *Petals none. Flowers in panicles, drooping in the bud.*

7. BOCCONIA. Sepals 2, colored. Stigma 2-lobed. Pod few-seeded. Juice reddish.

1. PAPÀVER, POPPY. (Ancient name.) We have no truly wild species: the following are from the Old World.

* *Annuals, flowering in summer: cult. and weeds of cultivation.*

P. somníferum, Opium Poppy. Cult. for ornament, especially double-flowered varieties, and for medical uses. Smooth, glaucous, with clasping and wavy leaves, and white or purple flowers.

P. Rhœas, CORN POPPY of Eu. Low, bristly, with almost pinnate leaves, and deep red or scarlet flowers with a dark eye, or, when double, of various colors; pod obovate.

P. dùbium, LONG-HEADED P. Leaves with their divisions more cut than the last; flowers smaller and lighter red, and pod oblong-clavate: run wild in fields in Penn.

* * *Perennial: cult. for ornament: flowering in late spring.*

P. orientàle, ORIENTAL P. Rough-hairy, with tall flower-stalks, almost pinnate leaves, and a very large deep-red flower, under which are usually some leafy persistent bracts. Var. BRACTEÀTUM, has these bracts larger, petals still larger and deeper red, with a dark spot at the base.

2. STYLÓPHORUM, CELANDINE POPPY. (Name means *style-bearer*, expressing a difference between it and Poppy and Celandine.) ♃

S. diphýllum. From Penn. W. in open woods; resembling Celandine, but low, and with far larger (yellow) flowers, in spring.

3. CHELIDÒNIUM, CELANDINE. (From the Greek word for the *Swallow*.) ② ♃

C. màjus, the only species, in all gardens and moist waste places; 1° – 4° high, branching, with pinnate or twice pinnatifid leaves, and small yellow flowers in a sort of umbel, all summer; the pods long and slender.

4. ARGEMÒNE, PRICKLY POPPY. (Meaning of name uncertain.) ①

A. Mexicàna, MEXICAN P. Waste places and gardens. Prickly, 1° – 2° high; leaves sinuate-lobed, blotched with white; flowers yellow or yellowish, pretty large, in summer. Var. ALBIFLÒRA has the flower larger, sometimes very large, white; cult. for ornament.

5. ESCHSCHÓLTZIA. (Named for one of the discoverers, *Eschscholtz*, the name easier pronounced than written.) ①

E. Califórnica, Californian annual, now common in gardens; with pale dissected leaves, and long-peduncled large flowers, remarkable for the top-shaped dilatation at the base of the flower, on which the extinguisher-shaped calyx rests: this is forced off whole by the opening petals. The latter are bright orange-yellow, and the top of the receptacle is broad-rimmed. Var. DOUGLÁSII wants this rim, and its petals are pure yellow, or sometimes white; but the sorts are much mixed in the gardens; and there are smaller varieties under different names.

6. SANGUINÀRIA, BLOOD-ROOT. (Name from the color of the juice.) ♃

S. Canadénsis, the common and only species; wild in rich woods, handsome in cultivation. The thick red rootstock in early spring sends up a rounded-reniform and palmate-lobed veiny leaf, wrapped around a flower-bud: as the leaf comes out of ground and opens, the scape lengthens, and carries up the handsome, white, many-petalled flower.

7. BOCCÒNIA. (Named in honor of an Italian botanist, *Bocconi*.) ♃

B. cordàta, CORDATE B., from China, the only hardy species; a strong root sending up very tall leafy stems, with round-cordate lobed leaves, which are veiny and glaucous, and large panicles of small white or pale rose-colored flowers, late in summer.

9. FUMARIACEÆ, FUMITORY FAMILY.

Like the Poppy Family in the plan of the flowers; but the 4-petalled corolla much larger than the 2 scale-like sepals, also irregular and closed, the two inner and smaller petals united by their

spoon-shaped tips, which enclose the anthers of the 6 stamens in two sets, along with the stigma: the middle anther of each set is 2-celled, the lateral ones 1-celled. Delicate or tender and very smooth herbs, with colorless and inert juice, and much dissected or compound leaves.

* *Corolla heart-shaped or 2-spurred at base: pod several-seeded.*

1. DICENTRA. Petals slightly cohering with each other. Seeds crested.
2. ADLUMIA. Petals all permanently united into one slightly heart-shaped body, which encloses the small pod. Seeds crestless. Climbing by the very compound leaves.

* * *Corolla with only one petal spurred at base.*

3. CORYDALIS. Ovary and pod slender, several-seeded. Seeds crested.
4. FUMARIA. Ovary and small closed fruit globular, 1-seeded.

1. DICÉNTRA (meaning two-spurred in Greek). Commonly but wrongly named DICLÝTRA or DIÉLYTRA. ♃ Fl. in spring.

* *Wild species, low, with delicate decompound leaves and few-flowered scapes sent up from the ground in early spring.*

D. Cucullària, DUTCHMAN'S BREECHES. Common in leaf-mould in woods N. Foliage and flowers from a sort of granular-scaly bulb; corolla white tipped with yellow, with the two diverging spurs at the base longer than the pedicel.

D. Canadénsis, CANADIAN D. or SQUIRREL-CORN. With the last N. Separate yellow grains, like Indian corn, in place of a scaly bulb; the corolla narrower and merely heart-shaped at base, white or delicately flesh-colored, sweet-scented; inner petals much crested at tip.

D. exímia is rarer, wild along the Alleghanies, occasionally cult., has coarser foliage, and more numerous flowers than the last, pink-purple, and produced throughout the summer, from tufted scaly rootstocks.

* * *Cultivated exotic, taller and coarser, leafy-stemmed, many-flowered.*

D. spectábilis, SHOWY D. or BLEEDING HEART. From N. China, very ornamental through spring and early summer, with ample Peony-like leaves, and long drooping racemes of bright pink-red heart-shaped flowers (1′ long): the two small sepals fall off in the bud.

2. ADLÚMIA, CLIMBING FUMITORY. (Named in honor of a *Mr. Adlum.*) ② The only species is

A. cirrhòsa. Wild in low shady grounds from New York W. & S. and cult.; climbing over bushes or low trees, by means of its 2–3-pinnately compound delicate leaves, the stalks of the leaflets acting like tendrils; flowers flesh-colored, panicled, all summer.

3. CORÝDALIS. (Greek name for Fumitory.) Our species are leafy-stemmed, ① or ②, wild in rocky places, fl. spring and summer.

C. glaùca, PALE CORYDALIS. Common, 6′–3° high, very glaucous, with the whitish flowers variegated with yellow and pink, a short and rounded spur, and erect pods.

C. flàvula, YELLOWISH C. From Penn. S. & W.: has the flowers pale yellow, with the tips of the outer petals wing-crested; seeds sharp-edged: otherwise like the next.

C. aùrea, GOLDEN C. From Vermont W. & S. Low and spreading; flowers golden-yellow with a longish spur, and crestless tips, hanging pods, and smooth blunt-edged seeds.

4. FUMÀRIA, FUMITORY. (Name from *fumus*, smoke.) ① Low, leafy-stemmed, with finely cut compound leaves.

F. officinàlis, COMMON F. Common in old gardens, waste places, and dung-heaps; a delicate small weed, with a close spike of small pinkish crimson-tipped flowers, in summer.

10. CRUCIFERÆ, MUSTARD FAMILY.

Herbs, with watery juice, of a pungent taste (as exemplified in Horseradish, Mustard, Water-Cress, &c.), at once distinguished by the cruciferous flower (of 4 sepals, 4 petals, their upper part generally spreading above the calyx in the form of a cross), the tetradynamous stamens (i. e. 6, two of them shorter than the other four); and the single 2-celled pistil with two parietal placentæ, forming the kind of pod called a silique, or when short a silicle. (See Lessons, p. 86, fig. 235, 236, for the flower, and p. 124, fig. 401, for the fruit.) The embryo fills the whole seed, and has the radicle bent up against the cotyledons. Flowers in racemes, which are at first short, like simple corymbs, but lengthen in fruiting: no bracts below the pedicels. The blossoms are all nearly alike throughout the family; so that the genera are mainly known by the fruit and seed, which are usually to be had before all the flowers have passed.

§ 1. *Fruit a true pod, opening lengthwise by two valves, which fall away and leave the thin persistent partition when ripe.*

* *Seeds or ovules more than two in each cell.*

+– *Pod beaked or pointed beyond the summit of the valves, or the style with a conical base. Seeds spherical, the cotyledons wrapped around the radicle.*

1. BRASSICA. Flowers yellow. Pods oblong or linear.

+– +– *Pod not beaked or conspicuously pointed,*

++ *Neither flattened nor 4-sided, but the cross-section nearly circular.*

2. SISYMBRIUM. Pods in the common species shortish, lance-awl-shaped, close-pressed to the stem. Seeds oval, marginless. Flowers small, yellowish.
3. NASTURTIUM. Pods shortish or short (from oblong-linear to almost spherical). Seeds in 2 rows in each cell, globular, marginless. Flowers yellow or white.
4. HESPERIS. Pods long and slender, with a single row of marginless seeds in each cell (as broad as the partition); the radicle laid against the back of one of the cotyledons. Flowers rather large, pink-purple. Stigma of 2 erect blunt lobes.
5. MALCOLMIA. Pods somewhat thickened at the base. Stigma of 2 pointed lobes. Otherwise as No. 4.
6. MATTHIOLA. Pods long and narrow: seeds one-rowed in each cell (as broad as the partition), flat, wing-margined; the radicle laid against one edge of the broad cotyledons. Flowers pink-purple, reddish, or varying to white, large and showy.

++ ++ *Pod long and slender, linear, 4-sided (the cross section square or rhombic), or if flattened having a strong salient midrib to the valves. Seeds marginless, mostly single-rowed in each cell. Flowers yellow or orange, never white.*

a. *Lateral sepals sac-shaped at the base.*

7. CHEIRANTHUS. Seeds flat; the radicle laid against the edge of the broad cotyledons. Flowers showy. Leaves entire.

b. *Sepals nearly equal and alike at the base.*

8. ERYSIMUM. Seeds oblong; the radicle laid against the back of one of the narrow cotyledons. Leaves simple.
9. BARBAREA. Seeds oval; the radicle laid against the edge of the broad cotyledons. Leaves lyrate or pinnatifid.
2. SISYMBRIUM. Seeds oblong; the radicle laid against the back of one of the cotyledons. Flowers small. Leaves twice pinnatifid.

++ ++ ++ *Pod flattened parallel to the partition; the valves flat or flattish: so are the seeds: radicle against the edge of the cotyledons. Flowers white or purple.*

10. ARABIS. Pod long and narrow-linear, not opening elastically; the valves with a midrib. Seeds often winged or margined.
11. CARDAMINE. Pods linear or lanceolate; the valves with no or hardly any midrib, opening elastically from the base upwards. Seeds marginless and slender-stalked, one-rowed in each cell. No scaly-toothed rootstock.

12. DENTARIA. Pods, &c. as in the preceding. Seed-stalks broad and flat. Stem 2–3-leaved in the middle, naked below, springing from a horizontal scaly-toothed or irregular fleshy rootstock.
13. LUNARIA. Pods oval or oblong, large and very flat, stalked above the calyx. Seeds winged, 2-rowed in each cell. Flowers pretty large, purple.
14. DRABA. Pods round-oval, oblong or linear, flat. Seeds wingless, 2-rowed in each cell. Flowers small, white in the common species.

++ ++ ++ ++ *Pod short, flattish parallel to the broad partition. Flowers yellow, small.*

15. CAMELINA. Pods turgid, obovate or pear-shaped.

++ ++ ++ ++ ++ *Pod short, very much flattened contrary to the narrow partition; the valves therefore deeply boat-shaped. Flowers white, small.*

16. CAPSELLA. Pods obovate-triangular, or triangular with a notch at the top.

* * *Seeds or the ovules single or sometimes* 2 *in each cell. Pods short and flat.*

+– *Corolla irregular, the petals being very unequal.*

17. IBERIS. Flowers in short and flat-topped clusters, white or purple ; the two petals on the outer side of the flower much larger than the others. Pods scale-shaped, roundish or ovate, much flattened contrary to the very narrow partition, notched at the wing-margined top.

+– +– *Corolla regular, small.*

18. LEPIDIUM. Pods scale-shaped, much flattened contrary to the very narrow partition, often notched or wing-margined at the top. Flowers white.
19. ALYSSUM. Pods roundish, flattened parallel to the broad partition. Seeds flat, commonly wing-margined. Flowers yellow or white.

§ 2. *Fruit indehiscent, wing-like,* 1*-seeded.*

20. ISATIS. Flowers yellow. Fruit 1-celled, 1-seeded, resembling a small samara or ash-fruit.

§ 3. *Fruit fleshy, or when ripe and dry corky, not opening by valves,* 2*–many-seeded.*

21. CAKILE. Fruit jointed in the middle ; the two short joints 1-celled, 1-seeded. Seed oblong.
22. RAPHANUS. Fruit several-seeded, with cellular matter or with constrictions between the spherical seeds.

1. BRÁSSICA, CABBAGE, MUSTARD, &c. (Ancient Latin name of Cabbage. Botanically the Mustards rank in the same genus.) ① ② Cult. from Eu., or run wild as weeds ; known by their yellow flowers, beak-pointed pods, and globose seeds, the cotyledons wrapped round the radicle.

B. oleràcea, CABBAGE. The original is a sea-coast plant of Europe, with thick and hard stem, and pretty large pale yellow flowers ; the leaves very glabrous and glaucous ; upper ones entire, clasping the stem, not auricled at the base : cult. as a biennial, the rounded, thick, and fleshy, strongly veined leaves collect into a head the first year upon the summit of a short and stout stem. — Var. BROCCOLI is a state in which the stem divides into short fleshy branches, bearing clusters of abortive flower-buds. — Var. CAULIFLOWER has the nourishing matter mainly concentrated in short imperfect flower-branches, collected into a flat head. — Var. KOHLRABI has the nourishing matter accumulated in the stem, which forms a turnip-like enlargement above ground, beneath the cluster of leaves. — KALE is more nearly the natural state of the species, the fleshy leaves not forming a head.

B. campéstris, of the Old World ; like the last, but with brighter flowers ; the lower leaves pinnatifid or divided and rough with stiff hairs, and the upper auricled at the base, is represented in cultivation by the Var. COLZA or RAPE, with small annual root, cult. for the oil of the seed. — Var. TURNIP (B. NAPUS) ; cult. as a biennial, for the nourishment accumulated in the napiform white root. — Var. RUTABAGA or SWEDISH TURNIP, has a longer and yellowish root.

B. Sinipástrum, or **Sinàpis arvénsis,** CHARLOCK. A troublesome weed of cultivation in grainfields, annual, with the somewhat rough leaves barely toothed or little lobed, and nearly smooth pods spreading in a loose raceme, the seed-bearing part longer than the conical (usually empty) beak.

B. (or **Sinàpis**) **alba,** WHITE MUSTARD. Cult. and in waste places, annual ; the leaves all pinnatifid and rough-hairy ; pods spreading in the raceme,

bristly, the lower and turgid few-seeded portion shorter than the 1-seeded stout and flattened beak; seeds large, pale brown.

B. (or **Sinàpis**) **nigra,** BLACK MUSTARD. Cult. and in waste places; leaves less hairy and less divided than the last; pods erect in the raceme or spike, smooth, short, 4-sided (the valves having a strong midrib), and tipped with the short empty conical base of a slender style; seeds dark brown, smaller, and more pungent than in the last.

2. SISŸMBRIUM, HEDGE MUSTARD. (The ancient Greek name.)

S. officinàle, COMMON H. ① Coarse weed in waste places, with branching stems, runcinate leaves, and very small pale yellow flowers, followed by awl-shaped obscurely 6-sided pods close pressed to the axis of the narrow spike.

S. canéscens, HOARY H. or TANSY-MUSTARD. ① Commonly only S. & W., hoary, with finely cut twice-pinnatifid leaves, minute yellowish flowers, and oblong-club-shaped 4-sided pods on slender horizontal pedicels.

3. NASTÚRTIUM, WATER-CRESS, HORSERADISH, &c. (Name from *nasus tortus*, convulsed nose, from the pungent qualities.) Here are combined a variety of plants, widely different in appearance: the following are the commonest.

* *Nat. from Eu.: the white petals twice the length of the calyx.* ↳

N. officinàle, WATER-CRESS. Planted or run wild in streamlets, spreading and rooting, smooth, with pinnate leaves of 3 – 11 roundish or oblong leaflets; fl. all summer; pods broadly linear, slightly curved upwards on their spreading pedicels. Young plants eaten.

N. Armoràcia, HORSERADISH. Planted or run wild in moist soil; with very large oblong or lanceolate leaves, chiefly from the ground, crenate, rarely cut or pinnatifid; pods globular, but seldom seen. The long deep root is a familiar condiment.

* * *Indigenous species, in wet places: petals yellow or yellowish.*

N. palústre, MARSH-CRESS. A very common homely weed, erect, 1° – 3° high, with pinnatifid or lyrate leaves of several oblong cut-toothed leaflets, small yellowish flowers, and small oblong or ovoid pods.

N. sessiliflòrum, like the last, but with less lobed leaves, very minute sessile flowers, and longer oblong pods, is common from Illinois S. And there are 2 or 3 more in some parts, especially S.

4. HÉSPERIS, ROCKET. (Greek for *evening*, the flowers being then fragrant.) ↳

H. matronàlis, COMMON or DAME R. Tall and rather coarse plant in country gardens, from Eu., inclined to run wild in rich shady soil; with oblong or lanceolate toothed leaves, and rather large purple flowers, in summer, followed by (2′ – 4′) long and slender pods.

5. MALCÒLMIA. (Named for *W. Malcolm*, an English gardener.)

M. marítima, MAHON STOCK, called VIRGINIA STOCK in England, but comes from the shores of the Mediterranean: a garden annual, not much cult., a span high, with pale green oblong or spatulate nearly entire leaves, and pretty pink-red flowers changing to violet-purple, also a white var. (much smaller than those of true Stock); pods long and slender.

6. MATTHÌOLA, STOCK or GILLIFLOWER. (Named for the early naturalist, *Matthioli.*) Cult. garden or house plants, from Eu., hoary-leaved, much prized for their handsome and fragrant, pretty large, pink, reddish, or white flowers, of which there are very double and showy varieties.

M. incàna, COMMON STOCK. ↳ Stout stem becoming almost woody: not hardy at the N.

M. ánnua, TEN-WEEK STOCK. ① Probably only an herbaceous variety of the last; flowers usually not double.

7. CHEIRANTHUS, WALLFOWER. (*Cheiri* is the Arabic name.) Like Stocks, but slightly if at all hoary, and the flowers orange, brown-red dish, or yellow. ¼

C. Cheiri, Common Wallflower. Cult. from S. Eu., not hardy N., a much-prized house-plant; stem woody, crowded with the narrow and pointed entire leaves.

8. ERYSIMUM. (Name from Greek, and meaning to draw blisters, from the acridity.)

E. asperum, Western Wallflower. Wild from Ohio W. & S.; like the wild state of the Wallflower, with bright yellow or orange flowers, but the seeds are different, and the long pods quite square in the cross-section; the leaves somewhat toothed and hoary. ② ¼

E. cheiranthoides, Treacle-Mustard or Wormseed Mustard. A rather insignificant annual, wild or run wild in waste moist places, with slender branches, lanceolate almost entire leaves, and small yellow flowers, followed by shortish and obscurely 4-sided pods on slender spreading pedicels.

9. BARBARÈA, WINTER-CRESS. (The Herb of Santa Barbara.) Different from the last genus in the seeds, divided leaves, and in the general aspect. Leaves used by some as winter salad, but bitterish. ② ¼

B. vulgàris, Common W. or Yellow Rocket. Smooth, common in old gardens and other rich soil, with green lyrate leaves, and bright yellow flowers, in spring and summer; pods erect, crowded in a dense raceme, much thicker than their pedicels.

B. præcox, Early W. or Scurvy-Grass. Cult. from Penn. S. for early salad, beginning to run wild, probably a variety of the last, with more numerous and narrower divisions to the leaves; the less erect pods scarcely thicker than their pedicels.

10. ÁRABIS, ROCK-CRESS. (Name from Arabic.) Fl. spring and summer. Leaves mostly simple and undivided.

* *Wild species, on rocks, &c.: flowers white or whitish, not showy.* ②

A. lyràta, Low R. A delicate, low, nearly smooth plant, with a cluster of lyrate root-leaves; stem-leaves few and narrow; bright white petals rather conspicuous; pods slender, spreading.

A. hirsùta, Hairy R. Strictly erect, 1° – 2° high; stem-leaves many and sagittate; small greenish-white flowers and narrow pods erect.

A. lævigàta, Smooth R. Erect, 1° – 2° high, glaucous; upper leaves sagittate; flowers rather small; pods 3′ long, very narrow and not very flat, recurving; seeds winged.

A. Canadénsis, Canadian or Sicklepod R. Tall, growing in ravines; stem-leaves pointed at both ends, pubescent; petals whitish, narrow; pods 3′ long, scythe-shaped, very flat, hanging; seeds broadly winged.

* * *Wild, on river banks: flowers pink-purple, rather showy.* ② ¼

A. hesperidoides, Rocket R. Smooth, erect, 1° – 3° high; with rounded or heart-shaped long-petioled root-leaves, ovate-lanceolate stem-leaves (2′ – 6′ long), the lower on a winged petiole or with a pair of small lateral lobes; petals long-clawed; pods spreading, narrow; seeds wingless. Banks of the Ohio and S. W.

* * * *Garden species: flowers white, showy.* ¼

A. alpina, Alpine R., and its variety? A. álbida, from Eu., low and tufted, hairy or soft-downy, are cult. in gardens; fl. in early spring.

11. CARDAMÌNE, BITTER-CRESS. (Ancient Greek name.) ¼

C. hirsùta, Small B. A low and branching insignificant herb, usually not hairy, with slender fibrous root, pinnate leaves, the leaflets angled or toothed, and small white flowers, followed by narrow upright pods: common in moist soil, fl. spring and summer.

C. praténsis, CUCKOO-FLOWER or LADIES' SMOCK. Stem ascending from a short perennial rootstock; the pinnate leaves with rounded and stalked entire small leaflets; flowers in spring, showy, pink or white: in bogs at the north, and a double-flowered variety is an old-fashioned plant in gardens.

C. rhomboídea. Stems upright from a small tuber, simple, bearing rather large white or rose-purple flowers in spring, and simple angled or sparingly toothed leaves, the lowest rounded or heart-shaped, the upper ovate or oblong: in wet places northward.

12. DENTÀRIA, TOOTHWORT. (From the Latin *dens*, a tooth.) ↳

D. diphýlla, TWO-LEAVED T., PEPPER-ROOT, or CRINKLE-ROOT. So called from the fleshy, long and toothed rootstocks, which are eaten and taste like Water-Cress; there are only 2 stem leaves, close together, each of 3 rhombic-ovate and toothed leaflets, and the root-leaf is similar; flowers quite large, white, in spring. Woods in vegetable mould, N.

D. laciniàta, LACINIATE T. Rootstock necklace-form or constricted in 2 or 3 places, scarcely toothed; stem-leaves 3 in a whorl, each 3-parted into linear or lanceolate leaflets, which are cut or cleft into narrow teeth, or the lateral ones 2-lobed; flowers purplish, in spring: banks of streams.

13. LUNÀRIA, HONESTY or SATIN-FLOWER. (Name from *Luna*, the moon, from the shape of the broad or rounded pods.) ② ↳

L. biénnis, COMMON HONESTY. Not native to the country, but cultivated in old-fashioned places, for the singular large oval pods, of which the broad white partitions, of satiny lustre, remaining after the valves have fallen, are used for ornament; leaves somewhat heart-shaped; flowers large, pink-purple, in early summer.

L. rediviva, PERENNIAL HONESTY, is a much rarer sort, with oblong pods; seldom met with here.

14. DRÀBA, WHITLOW-GRASS. (Name is a Greek word, meaning acrid.) Low herbs, mostly with white flowers: the commoner species are the following: fl. early spring; winter annuals.

D. Caroliniàna. Leaves obovate, hairy, on a very short stem, bearing a short raceme or corymb on a scape-like peduncle 1′ – 4′ high; petals not notched; pods broadly linear, much larger than their pedicels: in sandy waste places.

D. vérna. A diminutive plant, with a tuft of oblong or lanceolate root-leaves, and a scape 1′ – 3′ high; petals 2-cleft; pods oval or oblong, in a raceme, shorter than their pedicels: in sandy waste places.

15. CAMÉLINA, FALSE-FLAX. (An old name, meaning *dwarf-flax*; the common species was fancied to be a degenerate flax.) ②

C. sativa, COMMON F. A weed, in grain and flax-fields, 1° – 2° high, with lanceolate leaves, the upper ones sagittate and clasping the stem; small pale-yellow flowers, followed by obovate turgid pods in a long loose raceme; style conspicuous.

16. CAPSÉLLA, SHEPHERD'S-PURSE. (Name means *a little pod.*) ①

C. Bursa-Pastòris, COMMON S. The commonest of weeds, in waste places; root-leaves pinnatifid or toothed, those of the stem sagittate and partly clasping; small white flowers followed by the triangular and notched pods, in a long raceme.

17. IBÈRIS, CANDYTUFT. (Name from the country, *Iberia*, an old name for Spain.) Low garden plants, from Europe, cultivated for ornament; different from the rest of the order in the irregular corollas.

I. umbellàta, COMMON C. ②. Lower leaves lanceolate, the upper linear and entire; flowers purple-lilac (or pale), in flat clusters, in summer.

I. sempérvirens, EVERGREEN C. ↳ Rather woody-stemmed, tufted, with bright green lanceolate or linear-spatulate thickish entire leaves, and flat clusters of pure white flowers, in spring.

18. LEPÍDIUM, PEPPERGRASS. (A Greek word, meaning *little scale* from the pods.) Our common species have incised or pinnatifid leaves, and very small white or whitish flowers. ①

L. Virgínicum, Wild P. A common weed by roadsides, with petals, and usually only 2 stamens; the little pods orbicular and scarcely margined at the notched top; seeds flat, the radicle against the edge of the cotyledons.

L. ruderàle, introduced from Europe, is much less common, more branched, with no petals, smaller scarcely notched pods, and turgid seeds, the radicle against the back of one of the cotyledons.

L. satìvum, Garden P. Cult. as a cress, has petals, and the larger ovate pods are winged and slightly notched at the top.

19. ALÝSSUM, MADWORT. (Name refers to being a fancied remedy for canine madness.) Cult. for ornament; from Eu.

A. marítimum, Sweet Alyssum. A spreading little plant, from Europe, fl. all summer in gardens, or in the greenhouse in winter, green or slightly hoary, with lanceolate or linear entire leaves tapering at the base, and small white honey-scented flowers, in at length elongated racemes, the round little pods with a single seed in each cell. A variety much used for borders has paler and white-edged leaves.

A. saxátile, Rock A. Low, hoary-leaved, with abundant bright yellow flowers, in spring; cult. from Europe. ♃

20. ÌSATIS, WOAD. (Name of obscure derivation.) ② One common species of Eu.,

I. tinctòria, Dyer's Woad. Rather tall, glabrous and glaucous, with the stem-leaves lanceolate and entire, sessile and somewhat sagittate; the racemes of small yellow flowers panicled, succeeded by the hanging samara-like closed pods; fl. in early summer. Old gardens, formerly cult. for a blue dye.

21. CAKÌLE, SEA-ROCKET. (An old Arabic name.) ① ②

C. Americàna, American S. A fleshy herb, wild on the shore of the sea and Great Lakes, with obovate wavy-toothed leaves, and purplish flowers.

22. RÁPHANUS, RADISH. (Ancient Greek name, said to refer to the rapid germination of the seeds.) ① ② All from the Old World.

R. satìvus, Radish. Cult. from Eu.; with lyrate lower leaves, purple and whitish flowers, and thick and pointed closed pods; the seeds separated by irregular fleshy false partitions: cult. for the tender and fleshy pungent root, inclined to run wild.

R. caudàtus, Rat-tail R., from India, lately introduced into gardens, rather as a curiosity, is a probable variety of the Radish, with the narrow pod a foot or so long, eaten when green.

R. Raphanístrum, Wild R. or Jointed Charlock. Troublesome weed in cult. fields, with rough lyrate leaves, yellow petals changing to whitish or purplish, and narrow long-beaked pods, which are divided across between the several seeds, so as to become necklace-form.

11. CAPPARIDACEÆ, CAPER FAMILY.

In our region these are herbs, resembling *Cruciferæ*, but with stamens not tetradynamous and often more than 6, no partition in the pod (which is therefore 1-celled with two parietal placentæ), and kidney-shaped seeds, the embryo rolled up instead of folded together: the leaves commonly palmately compound, and the herbage bitter and nauseous instead of pungent. But in warm regions the Cress-like pungency sometimes appears, as in *capers*, the pickled flower-buds of Cápparis spinosa, of the Levant. This and its near relatives are trees or shrubs.

1. CLEOME. Calyx 4-cleft. Petals 4. Stamens 6, on a short thickened receptacle. Ovary and many-seeded pod in ours raised above the receptacle on a long stalk. Style very short or none. Usually an appendage on one side of the receptacle.
2. GYNANDROPSIS. Sepals 4. Stamens borne on the long stalk of the ovary far above the petals. Otherwise as in No. 1.
3. POLANISIA. Sepals 4. Stamens 8–32. Ovary and pod sessile or short-stalked on the receptacle. Style present. Otherwise nearly as No. 1.

1. CLEÒME. (From a Greek word meaning *closed*, the application not obvious.) ①

C. púngens. Tall (2° – 4° high), clammy-pubescent, with little spines or prickly points (whence the name) in place of stipules, about 7 broadly lanceolate leaflets, but the bracts simple and ovate or heart-shaped, and a raceme of large and handsome flowers, with long-clawed pink or purple petals and declined stamens. Cult. from S. America, for ornament, and run wild S.

C. integrifòlia, much smaller, very smooth, with 3 leaflets and the pink petals without claws, is wild in Nebraska, &c., and lately introduced to gardens.

2. GYNANDRÓPSIS. (Greek-made name, meaning that the stamens appear to be on the pistil.) (Lessons, p. 112, fig. 357.)

G. pentaphýlla. Nat. from Carolina S. from West Indies, is a clammy-pubescent weed, with 5 leaflets to the leaves and 3 to the bracts; the white petals on claws.

3. POLANÍSIA. (Greek-made name, meaning *many-unequal*, referring to the stamens.)

P. gravèolens. A heavy-scented (as the name denotes), rather clammy, low herb, with 3 oblong leaflets, and small flowers with short white petals, about 11 scarcely longer purplish stamens, and a short style; fl. summer. Wild on gravelly shores, from Conn. W.

12. RESEDACEÆ, MIGNONETTE FAMILY.

Herbs, with inconspicuous flowers in spikes or racemes; represented by the main genus,

1. RESÈDA, MIGNONETTE, &c. (From a Latin word, *to assuage*, from supposed medical properties.) Calyx 4 – 7-parted, never closed even in the bud. Petals 4 – 7, unequal, cleft or notched, those of one side of the flower appendaged within. Stamens 10 – 40, borne on a sort of disk dilated on one side of the flower. Ovary and pod composed of 3 – 6 carpels united not quite to the top into a 3 – 6-lobed or 3 – 6-horned 1-celled pistil which opens at the top long before the seeds are ripe. The seeds are numerous, kidney-shaped, on 3 – 6 parietal placentæ. Leaves alternate.

R. odoràta, COMMON MIGNONETTE. Cult. (from N. Africa) as an annual, for the delicious scent of the greenish-white flowers; the anthers orange; petals 6, the posterior ones cut into several fine lobes; stems low; some leaves entire and oblong, others 3-lobed.

R. Lutèola, DYER'S M. or WELD. Nat. along roadsides, tall, with lanceolate entire leaves, and a long spike of yellowish flowers; petals 4.

13. PITTOSPORACEÆ, PITTOSPORUM FAMILY.

A small family of shrubs and trees, belonging mostly to the southern hemisphere, in common cultivation represented only by one house-plant, a species of

1. PITTÓSPORUM. (Name means *pitchy seed* in Greek, the seeds being generally covered with a sticky exudation.) Flowers regular, of 5 sepals,

5 petals, and 5 stamens; the claws of the petals sometimes slightly united. ovary one-celled with three parietal placentæ, a single style and stigma. Fruit a globular woody pod, many-seeded.

P. Tobìra, COMMON P. A low tree, cultivated as a house-plant (from Japan), with obovate and retuse evergreen leaves crowded at the end of the branches, which are terminated by a small sessile umbel of white fragrant flowers, produced in winter.

14. VIOLACEÆ, VIOLET FAMILY.

Commonly known only by the principal genus of the order, viz.

1. **VÌOLA,** VIOLET. (Ancient Latin name.) Sepals 5, persistent. Petals 5, more or less unequal, the lower one with a sac or spur at the base. (Lessons, p. 86, fig. 237, 238.) Stamens 5, short: the very broad flat filaments conniving and slightly cohering around the pistil, which they cover, all but the end of the style and the (usually one-sided) stigma, bearing the anthers on their inner face, two of these spurred at the base. Ovary and pod 1-celled, with 3 parietal placentæ, containing several rather large seeds. — Herbs, with stipules to the alternate leaves, and 1-flowered peduncles.

* STEMLESS VIOLETS, *with leaves and peduncles all from creeping or subterranean rootstocks, there being no proper ascending stems: all flowering in spring, also producing inconspicuous flowers and most of the fruitful pods, all summer, concealed among the leaves.*

+– *Garden species, from Europe: fragrant.*

V. odoràta, SWEET VIOLET. Cult. from Eu., the tufts spreading by creeping runners; leaves rounded heart-shaped, more or less downy; flowers purple-blue (violet-color) varying to bluish and white, single or in cultivation commonly full double. Hardy; while the ITALIAN VIOLET, the variety used for winter-blooming, with leaves smoother and brighter green and flowers paler or grayish-blue, is tender northward.

+– +– *Wild species: slightly sweet-scented or scentless.*

+– *Flowers blue or violet-color.*

V. Selkírkii, SELKIRK'S V. Small, only 2′ high, the rounded heart-shaped leaves spreading flat on the ground; the flower large in proportion, its thick spur nearly as long as the beardless petals: on shady banks, only N.

V. sagittàta, ARROW-LEAVED V. One of the commonest and earliest; leaves varying from oblong-heart-shaped to ovate and often rather halberd-shaped, the earlier ones on short and margined petioles; flower large in proportion; spur short and sac-shaped, as in all the following.

V. cucullàta, COMMON BLUE V. The tallest and commonest of the blue violets, in all low grounds, with matted fleshy and scaly-toothed rootstocks, erect and heart-shaped or kidney-shaped obscurely serrate leaves, with the sides at the base rolled in when young, on long petioles; flowers sometimes pale or variegated with white.

V. palmàta, HAND-LEAF V., is a variety of the last, with the leaves, or all the later ones, 3 – 7-cleft or parted; common southward.

V. pedàta, BIRD-FOOT V. Grows in sandy or light soil, from a short and thick or tuber-like rootstock; the leaves all cut into linear divisions or lobes; the flower large, beardless, usually light violet-color: sometimes the two upper petals deep dark violet, like a pansy.

V. delphinifòlia, LARKSPUR-LEAVED V., takes the place of the preceding in prairies, &c. W. and is like it, but has the lateral petals bearded.

+– +– *Flowers (small) white, the lower petal purplish-veined.*

V. blánda, SWEET WHITE V. Very common, with faintly sweet-scented flowers, all the petals beardless; leaves rounded heart-shaped or kidney-shaped.

V. primulæfòlia, PRIMROSE-LEAVED V. Common S., between the last and next, has oblong or ovate leaves.

V. lanceolàta, LANCE-LEAVED V. Commonest S., has lanceolate leaves tapering into long petioles, and beardless petals.

+ + + *Flowers yellow.*

V. rotundifòlia, ROUND-LEAVED V. Only in cold woods N.; the roundish heart-shaped leaves flat on the ground, becoming large and shining in summer; spreads by runners; flower small.

* * LEAFY-STEMMED VIOLETS, *wild, perennial: flowering in spring and summer.*

+ *Flowers yellow, short-spurred: stem 2–4-leaved above, naked below.*

V. pubéscens, DOWNY YELLOW V. Common in rich woods; soft-downy, also a rather smooth variety; leaves broadly heart-shaped.

V. hastàta, HALBERD-LEAVED V. Scarce W. & S.; smoother; leaves oblong-heart-shaped, halberd-shaped, or 3-lobed; flower small.

+ + *Flowers not yellow: stem branched, leafy below: leaves rounded heart-shaped*

V. striàta, PALE V. Not rare N. & W., low; flowers creamy-white, with lower petal purple-lined; spur short; stipules large in proportion, strongly fringe-toothed.

V. canina, DOG V., the Amer. variety: common in low grounds; low, with creeping branches or short runners, fringe-toothed stipules, and spur half the length of the violet flower.

V. rostràta, LONG-SPURRED V. Shady hills N. & W.; 6′ high, with fringe-toothed stipules, and slender spur longer than the pale violet petals.

V. Canadénsis, CANADA V. Common in rich woods N. & W., taller than the others, 1°–2° high, larger-leaved, with entire stipules; flowers all summer, the petals white or purplish above, the upper ones violet-purple underneath; spur very short and blunt.

* * * PANSY VIOLETS, *from Europe, with leafy and branching stems, and large leaf-like stipules: flowering through the spring and summer.*

V. trícolor, PANSY or HEART'S-EASE. Cult. or running wild in gardens, low, with roundish leaves, or the upper oval and lowest heart-shaped; stipules lyrate-pinnatifid; petals of various colors, and often variegated, and under cultivation often very large and showy, the spur short and blunt. — Var. ARVÉNSIS, is a field variety, slender and small-flowered, thoroughly naturalized in some places. ① ② 2

V. cornùta, HORNED V. From the Pyrenees, cult. in borders of late; has stipules merely toothed, and light violet-purple flowers with a very long and slender spur. 2

15. DROSERACEÆ, SUNDEW FAMILY.

Bog-herbs, with regular flowers, on scapes; leaves in a tuft at the root, glandular-bristly or bristly-fringed, and rolled up from the apex in the bud, in the manner of Ferns; the persistent sepals and withering-persistent petals each 5; stamens 5–15 with their anthers turned outward; and a 1-celled many-seeded pod. Represented by two genera.

1. DROSERA. Stamens 5. Styles 3–5, but 2-parted so as to seem like 6–10. Ovary with 3 parietal placentæ. Reddish-colored and sticky-glandular.
2. DIONÆA. Stamens 15. Style 1: stigma lobed and fringed. Ovules and seeds all at the broad base of the ovary and pod. Leaves terminated by a bristly-bordered fly-trap.

1. DRÓSERA, SUNDEW. (Name means in Greek *dewy,* or *beset with dew-drops,* the gland surmounting the bristles of the leaves producing a clear and dew-like drop of liquid, which is glutinous, and serves to catch small flies.) Flowers small, in a 1-sided spike or raceme, each opening only once, in sunshine, in summer. 2

* *Flowers small, white: leaves with a blade.*

D. rotundifòlia, ROUND-LEAVED S. The commonest species in peat-bogs, white round leaves on long petioles spreading in a tuft. When a small fly or other insect is caught by the sticky glands on the upper face of the leaf,

the bristles of the outer rows very slowly turn inwards, so that their glands help to hold the prey!

D. longifòlia, LONGER-LEAVED S. In very wet bogs or shallow water, with spatulate-oblong leaves, some of them erect, on long petioles.

D. brevifòlia, SHORT-LEAVED S. In wet sand, only at the S.; small; scape only 2′ – 5′ high, few-flowered; leaves short, wedge-shaped.

* * *Flowers rose-purple: no blade to the leaf.*

D. filifòlia, THREAD-LEAVED S. In wet sandy soil near the coast, from Plymouth, Mass., to Florida; leaves erect, thread-shaped; scape 6′ – 12′ high, from a bulb-like base; flowers handsome, ½′ or more broad.

2. DIONÆÁ, VENUS'S FLY-TRAP. (Named for the mother of Venus.) ♃ Only one species,

D. muscípula. Grows only in sandy bogs near Wilmington, N. Car., but kept in conservatories as a great curiosity. (See Lessons, p. 65, fig. 176, for the leaves, and the way they catch insects!) Flowers white, borne in an umbel-like cyme on a scape 1° high, in spring.

16. CISTACEÆ, ROCK-ROSE FAMILY.

Shrubby or low herbaceous plants, with regular flowers; a persistent calyx of 5 sepals, two of them exterior and resembling bracts; the petals and stamens on the receptacle; the style single or none; ovary 1-celled with 3 or 5 parietal placentæ (Lessons, fig. 334), bearing orthotropous ovules. Represented in greenhouses by one showy species, CISTUS LADANIFERUS of Europe (not common), and in sandy woods and fields by the following wild plants.

1. HELIANTHEMUM. Petals 5, crumpled in the bud, fugacious (falling at the close of the first day). Stamens and ovules many in the complete flower: placentæ 3. Style none or short.
2. HUDSONIA. Petals as in the last. Calyx narrow. Stamens 9 – 30. Style slender. Ovules few.
3. LECHEA. Petals 3, persistent, not longer than the calyx. Stamens 3 – 12. Style none. Pod partly 3-celled, 6-seeded.

1. HELIÁNTHEMUM, FROSTWEED. (Name from Greek words for *sun* and *flower*, the blossoms opening only in sunshine. Popular name, from crystals of ice shooting from the cracked bark at the root late in the autumn.) Low, yellow-flowered, in sandy or gravelly soil. ♃

H. Canadénse, CANADIAN or COMMON F. Common, and the only one N.; has lance-oblong leaves hoary beneath; flowers produced all summer, some with showy corolla 1′ broad and many stamens; others small and clustered along the stem, with inconspicuous corolla and 3 – 10 stamens; the latter produce small few-seeded pods.

H. corymbòsum, only along the coast S., is downy all over, with smaller flowers clustered at the top of the stem, and larger ones long-peduncled.

H. Caroliniànum, grows only S., is hairy, with green leaves, the lower obovate and clustered; flowers all large-petalled and scattered, in spring.

2. HUDSÒNIA. (For an English botanist, *William Hudson.*) Heath-like little shrubs, 6′ – 12′ high, nearly confined to sandy shores of the ocean and Great Lakes, with minute downy leaves closely covering the branches, and small yellow flowers, opening in sunshine, in spring and summer.

H. ericoìdes, HEATH-LIKE H. Greenish; leaves awl-shaped; flowers peduncled. From New Jersey N.

H. tomentòsa, DOWNY H. Hoary with soft down; leaves oblong or oval and close pressed; peduncles short or hardly any. From New Jersey to Maine and Lake Superior.

3. LÉCHEA, PINWEED. (For *Leche,* a Swedish botanist.) Small, homely herbs, with inconspicuous greenish or purplish flowers, and pods about the size of a pin's head, whence the popular name: common in sterile soil; fl. summer and autumn. ♃

L. màjor, LARGER P. Stem upright, hairy, 1°–2° high; leaves elliptical, mucronate; flowers densely clustered. Borders of sterile woodlands.

L. mìnor, SMALLER P. Stems low, 6′–18′ high, often straggling, minutely hairy; leaves linear; flowers loosely racemed on the branches. Open sterile ground.

17. HYPERICACEÆ, ST. JOHN'S-WORT FAMILY.

Distinguished from all other of our plants by the opposite and entire simple and chiefly sessile leaves, punctate with translucent and commonly some blackish dots, perfect flowers with the stamens (usually many and more or less in 3 or 5 clusters) inserted on the receptacle, and a pod either 1-celled with parietal placentæ or 3–5-celled (see Lessons, p. 108, fig. 333, 335, 336), filled with many small seeds. Juice resinous and acrid. All here described are wild plants of the country.

* *No glands between the stamens. Petals convolate in the bud.*

1. ASCYRUM. Sepals 4; the outer pair very broad, the inner small and narrow. Petals 4, yellow. Stamens many. Ovary 1-celled.
2. HYPERICUM. Sepals and (yellow) petals 5. Stamens many, rarely few.

* * *Large gland between each of the* 3 *sets of stamens. Petals imbricated in the bud.*

3. ELODES. Sepals and erect flesh-colored. Petals 5. Stamens 9 to 12, united in 3 sets. Ovary 3-celled. Flowers axillary.

1. ÁSCYRUM, ST. PETER'S-WORT. (Greek name means without roughness, being smooth plants.) Leafy-stemmed, woody at the base, with 2-edged branches; wild in pine barrens, &c., chiefly S. Fl. summer. ♃

* *A pair of bractlets on the pedicel: styles short.*

A. Crux-Ándreæ, ST. ANDREW'S CROSS. From New Jersey to Illinois & S.; stems spreading; leaves thinnish, narrow-oblong and tapering to the base; flowers rather small, with narrow pale yellow petals and only 2 styles.

A. stans, COMMON ST. PETER'S-WORT. From New Jersey S.; stems 2°–3° high; leaves thickish, closely sessile, oval or oblong; flowers larger, with obovate petals and 3 or 4 styles.

* * *No bractlets on the pedicel: styles longer than ovary.*

A. amplexicaùle, CLASPING-LEAVED S. Only found S., with erect stems many times forking above, and closely sessile heart-shaped leaves; styles 3.

2. HYPÉRICUM, ST. JOHN'S-WORT. (Ancient name, of uncertain derivation.) Fl. in summer, in all ours yellow.

* *Shrubs or perennial herbs: stamens very many.*

+ *Styles* 5 *(rarely more) united below into one: pod* 5*-celled.*

H. pyramidàtum, GREAT-FL. S. Herb, 2°–4° high, with ovate-oblong partly-clasping leaves, and large flowers, the petals rather narrow, 1′ long, and 5 clusters of stamens. River-banks N. & W.

H. Kalmiànum, KALM'S S. Low shrub, with glaucous oblanceolate leaves and rather large flowers. N. W.: rare, except at Niagara Falls.

+ + *Styles* 3 *partly united, or at first wholly united to the top into one* (*see* Lessons, p. 107, fig. 329): *sepals leafy, spreading.*

++ *Shrubby, deciduous-leaved, both Northern and Southern.*

H. prolíficum, SHRUBBY S. Like the last, but leaves scarcely glaucous, lance-oblong or linear; pod 3-celled.

++ ++ *Shrubby, evergreen or nearly so, only Southern.*

H. fasciculàtum, Fascicled S. Leaves narrow-linear and small, and with shorter ones clustered in the axils; pod narrow. Wet pine barrens.

H. myrtifòlium, Myrtle-leaved S. Leaves heart-shaped and partly clasping, thick, glaucous; pod conical. Wet pine barrens.

H. aùreum, Golden S. Leaves oblong with a narrow base, glaucous beneath; thick; flowers mostly single, very large (2′ broad), orange-yellow; pod ovate. River-banks towards the mountains.

H. nudiflòrum, Naked-clustered S. Shrubby and evergreen S., less so in Virginia, &c., has 4-angled branches, oblong pale leaves, and a peduncled naked cyme of rather small flowers; pods conical.

++ ++ ++ *Herbaceous, simple-stemmed, Northern & Western.*

H. sphærocárpon, Spherical-fruited S. About 2° high; leaves diverging, oblong-linear (2′ long), obtuse; flowers numerous, small, in a naked flat cyme; sepals ovate; pod globular, 1-celled. Rocky banks, W.

H. adpréssum, Upright-leaved S. A foot high; leaves ascending, lanceolate, often acute; flowers few and rather small; sepals narrow; pod oblong, partly 3-celled. Low grounds, Pennsylvania to Rhode Island.

H. ellípticum, Elliptical-leaved S. Barely 1° high; leaves spreading, oblong, thin; flowers rather few in a nearly naked cyme, pale; the pod purple, oblong-oval, obtuse, 1-celled. Wet soil, N.

+ + + *Styles* 3 *wholly separate* (*see* Lessons, fig. 328): *herbs.*

++ *Ovary and pod* 3-*celled: petals black-dotted: styles mostly diverging.*

H. perforàtum, Common S. The only one not indigenous, nat. from Eu., a troublesome weed in fields, &c.; spreads by runners from the base; upright stems branching; leaves oblong or linear-oblong, with pellucid dots; flowers rather large in open leafy cymes; the deep yellow petals twice the length of the lanceolate acute sepals. The juice is very acrid.

H. corymbòsum, Corymbed S. Common N. in moist ground; stem 2° high, sparingly branched; leaves oblong, slightly clasping, having black as well as pellucid dots; flowers rather small, crowded; petals light yellow and black-lined as well as dotted; sepals oblong; styles not longer than the pod.

H. maculàtum, Spotted S. Common S. has somewhat heart-shaped or more clasping leaves, lanceolate sepals, and very long and slender styles: otherwise like the last.

++ ++ *Ovary* 1-*celled: stem strict: leaves ascending, acute, closely sessile, short.*

H. angulòsum, Angled S. Wet pine-barrens from New Jersey S. Stem sharply 4-angled (1° – 2° high), smooth; leaves ovate or lance-oblong; flowers scattered along the ascending branches of the cyme, small, copper-yellow; styles slender.

H. pilòsum, Hairy S. Wet pine-barrens S. Stem terete, and with the lance-ovate leaves roughish-downy; styles short.

* * *Annual, low and slender, small-flowered herbs: stamens* 5 – 12: *ovary and brown-purple pod strictly* 1-*celled: styles* 3, *separate: sepals narrow, erect: petals narrow.*

+ *Leaves conspicuous and spreading: flowers in cymes.*

H. mùtilum, Small S. Slender, much branched and leafy up to the flowers; leaves partly clasping, thin, 5-nerved, ovate or oblong; petals pale yellow. Everywhere in low grounds.

H. Canadénse, Canadian S. Stem and branches strictly erect; leaves linear or lanceolate, 3-nerved at the base; petals copper-yellow. Wet sandy soil.

+ + *Leaves erect, awl-shaped or scale-like and minute: flowers very small and scattered along the numerous bushy and wiry slender branches.*

H. Drummóndii, Drummond's S. In dry barrens, W. Illinois and S., with linear-awl-shaped leaves, short-pedicelled flowers, and pods not longer than the calyx.

H. Saròthra, Orange-grass or Pine-weed. Common in dry sterile soil, with minute awl-shaped appressed scales for leaves, flowers sessile on the wiry branches, and slender pods much exceeding the calyx.

3. ELÒDES, MARSH ST. JOHN'S-WORT. (Greek for *marshy.*) In water or wet bogs, with pale often purple-veined oblong or ovate leaves, and close clusters of small flowers in their axils, produced all summer. Petals pale purple or flesh-color, equal-sided, erect. ♃

E. Virgínica, the commonest, has the roundish or broadly oblong leaves clasping by a broad base.

E. petiolàta, commoner S., has the leaves tapering into a short petiole.

18. ELATINACEÆ, WATER-WORT FAMILY.

Little marsh annuals, resembling Chickweeds, but with membranaceous stipules between the opposite leaves, and seeds as in preceding family. Represented by

1. ELÁTINE, WATER-WORT. (Greek name of some herb.) Sepals, petals, stamens and cells of the ovary and stigmas or styles of the same number, each 2, 3, or 4, all separate on the receptacle. Seeds straightish or curved. Flowers minute in the axils of the leaves.

E. Americàna. Creeping and spreading on muddy shores of ponds, &c., about 1′ high, not very common; leaves obovate; parts of the flower 2, rarely 3; pod very thin.

19. TAMARISCINEÆ, TAMARISK FAMILY.

Shrubs or small trees of the Old World, represented in ornamental grounds by

1. TÁMARIX, TAMARISK. (Named for the *Tamarisci,* or the river *Tamaris,* on which these people lived.) Sepals and petals 4 or 5, persistent, or the latter withering, and stamens as many or twice as many, all on the receptacle. Ovary pointed, 1-celled, bearing many ovules on three parietal placentæ next the base: styles 3. Seeds with a plume of hairs at the apex. Shrubs or small trees of peculiar aspect, with minute and scale-shaped or awl-shaped alternate leaves appressed on the slender branches, and small white or purplish flowers in spikes or racemes. The only one planted is

T. Gállica, FRENCH T. Barely hardy N., often killed to the ground, a picturesque, delicate shrub, rather Cypress-like in aspect, glaucous-whitish, the minute leaves clasping the branches, nearly evergreen where the climate permits.

20. CARYOPHYLLACEÆ, PINK FAMILY.

Bland herbs, with opposite entire leaves, regular flowers with not over 10 stamens, a commonly 1-celled ovary with the ovules rising from the bottom of the cell or on a central column, and with 2 – 5 styles or sessile stigmas, mostly separate to the base. (See Lessons, p. 108, fig. 331, 332.) Seeds with a slender embryo on the outside of a mealy albumen, and usually curved into a ring around it. Calyx persistent. Petals sometimes minute or wanting. Divides into two great divisions or suborders, viz. the true PINK FAMILY, and the CHICKWEED FAMILY, to the latter of which many plants like them, but mostly single-seeded and without petals, are appended.

I. PINK FAMILY PROPER. Sepals (5) united below into a tube or cup. Petals with slender claws which are enclosed in the calyx-tube, and commonly raised within it, with the 10 stamens, on a sort of stalk, often with a cleft scale or crown at the junction of the blade and claw. (Lessons, p. 90, fig. 248.) Pod mostly opening at the top, many-seeded.

* *Calyx with a scaly cup or set of bracts at its base: styles* 2.

1. DIANTHUS. Calyx cylindrical, faintly many-striate. Petals without a crown. Seeds attached by the face: embryo in the albumen and nearly straight!

* * *Calyx naked at base: seeds attached by the edge: embryo curved.*

2. LYCHNIS. Styles 5, rarely 4. Calyx not angled, but mostly 10-nerved.
3. SILENE. Styles 3. Calyx not angled, mostly 10-nerved.
4. VACCARIA. Styles 2. Calyx pyramidal, becoming 5-wing-angled.
5. SAPONARIA. Styles 2. Calyx cylindrical or oblong, not angled, 5-toothed. Pod 4-valved at the top.
6. GYPSOPHILA. Styles 2. Calyx bell-shaped, 5-cleft, or thin and delicate below the sinuses. Pod 4-valved. Flowers small and panicled, resembling those of Sandwort, &c.

II. CHICKWEED FAMILY, &c. Petals spreading, without claws, occasionally wanting. Sepals (4 or 5) separate or united only at base, or rarely higher up. Flowers small, compared with the Pink Family, and the plants usually low and spreading or tufted.

* *Without stipules, generally with petals: pod several-seeded.*

7. SAGINA. Styles and valves of the pod as many as the sepals and alternate with them (4 or 5). Petals entire or none. Small plants.
8. CERASTIUM. Styles as many as the sepals and opposite them (5). Petals notched at the end or 2-cleft, rarely none. Pod mostly elongated, opening at the top by 10 teeth.
9. STELLARIA. Styles fewer than the sepals (3 or sometimes 4) and opposite as many of them. Petals 2-cleft, or sometimes none. Pod globular or ovoid, splitting into twice as many valves as there are styles.
10. ARENARIA. Styles (commonly only 3) fewer than the sepals and opposite as many of them. Petals entire, rarely none. Pod globular or oblong, splitting into as many or twice as many valves as there are styles.

* * *With scarious stipules between the leaves, conspicuous and entire petals, and a many-seeded* 3 – 5*-valved pod.*

11. SPERGULARIA. Styles usually 3. Leaves opposite.
12. SPERGULA. Styles 5, as many as the sepals and alternate with them. Leaves in whorls.

* * * *Without petals: the fruit (utricle)* 1*-seeded and indehiscent.*

13. ANYCHIA. Sepals 5, nearly distinct. Stamens 2 – 5. Stigmas 2, sessile. Stipules and flowers minute.
14. SCLERANTHUS. Sepals (5) united below into an indurated cup, narrowed at the throat where it bears 5 or 10 stamens, enclosing the small utricle. Styles 2. Stipules none.

* * * * *Without petals, but the* 5 *sepals white and petal-like inside: stipules obscure if any: fruit a* 3*-celled many-seeded pod.*

15. MOLLUGO. Stamens generally 3, on the receptacle. Stigmas 3. Pod 3-valved, the partitions breaking away from the seed-bearing axis and adhering to the middle of the valves.

1. DIÁNTHUS, PINK. (Greek name, meaning Jove's own flower.) All but the first species cultivated for ornament: fl. summer.

* *Flowers sessile and many in a close cluster, with long and narrow-pointed bracts under the calyx, except in the last.*

D. Armèria, Deptford Pink of Europe, has got introduced into fields in a few places; a rather insignificant plant, somewhat hairy, narrow-leaved, with very small scentless flowers; petals rose-color with whitish dots. ①

D. barbàtus, Sweet William or Bunch Pink, of Europe, with thinnish oblong-lanceolate green leaves, and a very flat-topped cluster of various-colored flowers, the petals sharply toothed, abounds in all country gardens; the many double-flowered varieties are more choice. 2

D. Carthusianòrum, Carthusians' Pink, from Eu., has linear leaves, slender stems, and a dense cluster of small flowers; bracts ovate or oblong, abruptly awn-tipped, brown, shorter than the calyx; petals merely toothed, short, usually dark purple or crimson: now rather scarce in gardens. 2

* * *Flowers single at the ends of the branches: leaves narrow and often grass-like, rather rigid, glabrous and glaucous, usually without any evident veins.*

D. Chinénsis, China or Indian Pink, has lanceolate leaves, less rigid and greener than any of the following, and linear acute scales or bracts as long as the calyx; the large petals toothed or cut, of various colors, red, purple, violet, &c. The garden var. Heddewigii is a more glaucous and large-flowered form, lately introduced. ① ②

D. Caryophýllus, Clove Pink, the parent of all the sorts of Carnation, &c., has the stems almost woody below, very glaucous long-linear leaves; the scales under the calyx very short and broad; petals merely toothed, of various colors. Scarcely hardy N. 2/

D. plumàrius, Pheasant's-eye or Plumed Pink. A low, hardy species, making broad tufts, with small very glaucous leaves, sending up flower-stems in early summer, the white or pink or variegated petals cut into a fringe of slender lobes. 2/

D. supérbus, is taller, less tufted, and later-flowered; the large petals entirely dissected into delicate almost capillary divisions. 2/

2. LÝCHNIS. (Greek name for *lamp*, the down of the Mullein Lychnis having been used for wicking.) All from the Old World: fl. summer.

§ 1. *Calyx with long leaf-like lobes: petals naked.* ①

L. Githàgo, Corn-Cockle. A weed in grain-fields, hairy, with long linear leaves, and long-peduncled showy red-purple flowers; in fruit the calyx-lobes falling off; the black seeds injurious to the grain.

§ 2. *Calyx without long leaf-like lobes: petals crowned with a 2-cleft little scale or pair of teeth on the base of the blade or at the top of the claw.* 2/

L. coronària, Mullein-Lychnis or Mullein Pink. Cult. in gardens; the flower crimson and like that of Corn-Cockle; but teeth of the calyx short and slender; plant white-cottony; leaves oval or oblong. ② 2/

L. Flos-Jòvis, Jupiter's L. Less common in gardens, downy-hairy or cottony and whitish; leaves lance-oblong; flowers many and smaller, in a head-like long-peduncled cluster, reddish-purple; petals obcordate.

L. Chalcedónica, Maltese-Cross or Scarlet L. Very common in country-gardens; tall, rather hairy and coarse, with lance-ovate partly clasping green leaves, and a very dense flat-topped cluster of many smallish flowers; the bright scarlet or brick-red petals deeply 2-lobed.

L. grandiflòra, Large-flowered L. Cult. from China; smooth, with oblong green leaves tapering to both ends, and the branches bearing single or scattered short-peduncled flowers, which are 2′ or 3′ across; the red or scarlet petals fringe-toothed at the end.

L. Viscària, Viscid L. Rather scarce in gardens; smooth, but the slender stem glutinous towards the top; leaves linear; flowers many in a narrow raceme-like cluster, rather small; calyx tubular or club-shaped; petals pink-red, slightly notched: also a double-flowered variety.

L. Flos-cùculi, Cuckoo L. Ragged Robin is the double-flowered variety, in gardens; slightly downy and glutinous, with lanceolate leaves, and an open panicle of pink-red petals, these cleft into 4 narrow-linear lobes.

L. diúrna, Day-blooming L. Double-flowered form also called Ragged Robin in the gardens; smoothish or soft-hairy; leaves oblong or lance-ovate, the upper ones pointed; flowers scattered or somewhat clustered on the branches, rose-red.

L. vespertina, Evening-blooming L. A weed in some waste grounds, like the last, and more like the Night-flowering Catchfly; but has 5 styles and a more ovate enlarging calyx; the flowers are commonly dicœcious, white, and open after sunset, the root biennial. But a full double-flowering variety in gardens is perennial, day-flowering, and is a white sort of Ragged Robin.

3. SILÈNE, CATCHFLY. (Both names refer to the sticky exudation on stems and calyx of several species, by which small insects are often caught.) Besides the following, some other wild or cultivated species are met with, but not common. Fl. mostly all summer.

* *All over sticky-hairy: naturalized from Europe.* ①

S. noctiflòra, NIGHT-FLOWERING C. Tall coarse weed in cult. or waste grounds; lower leaves spatulate, upper lanceolate and pointed; flowers single or in loose clusters terminating the branches, with awl-shaped calyx-teeth and white or pale rosy 2-parted petals, opening at nightfall or in cloudy weather.

* * *Smooth, a part of each of the upper joint of stem glutinous: flowers small.* ①

S. Armèria, SWEET-WILLIAM C. In old gardens or running wild, from Europe; stem about 1° high, branching into flat-topped cymes of many flowers, which are rather showy; calyx club-shaped; petals notched, bright pink, or a white variety, opening only in sunshine; leaves lance-ovate, glaucous.

S. antirrhìna, SLEEPY C. Wild in sandy or gravelly soil; stem slender, 6′ – 20′ high, rather simple; flowers very small, panicled; calyx ovoid; petals rose-color, obcordate, opening only at midday in sunshine; leaves lanceolate or linear.

* * * *Somewhat sticky-pubescent, at least the calyx, which is oblong, tubular, or club-shaped: wild species, with red or pink showy flowers.* 2

S. Pennsylvánica, PENNSYLVANIAN C. or WILD PINK. In gravelly soil; stems 4′ – 8′ high, bearing 2 or 3 pairs of lanceolate leaves and a cluster of short-stalked middle-sized flowers, in spring; petals pink-red, wedge-shaped, slightly notched.

S. Virgínica, VIRGINIAN C. or FIRE PINK. In open woods W. & S.; 1° – 2° high; leaves spatulate or lanceolate; flowers few, peduncled; the pretty large bright crimson-red petals 2-cleft.

S. règia, ROYAL C. Prairies, &c., from Ohio S.; like the last, but 3° high, with lance-ovate leaves, numerous short-peduncled flowers in a narrow panicle, and narrower scarlet-red petals scarcely cleft.

* * * * *Not sticky: calyx inflated and bladdery: petals rather small, white.* 2

S. stellàta, STARRY CAMPION. Wild on wooded banks; stem slender, 2° – 3° high; leaves in whorls of 4, lance-ovate, pointed; flowers in a long and narrow panicle; petals cut into a fringe.

S. inflàta, BLADDER CAMPION. Wild in fields E., but nat. from Eu., glaucous or pale and very smooth, 1° high, with ovate-lanceolate or oblong leaves, and an open cyme of flowers; the bladdery calyx veiny; petals 2-cleft.

4. VACCÀRIA, COW-HERB. (Name from Latin *vacca*, a cow.) ①

V. vulgàris, COMMON C. In gardens or running wild near them, from Eu.; smooth, 1° – 2° high, with pale lanceolate partly clasping leaves, and a loose open cyme of flowers; petals pale red, naked, not notched; fl. summer.

5. SAPONÀRIA, SOAPWORT. (Latin and common names from the mucilaginous juice of the stem and root forming a lather.) From Europe.

S. officinàlis, COMMON S. or BOUNCING BET. A rather stout, 1° – 2° high, nearly smooth herb, in gardens, and running wild by roadsides; leaves 3 – 5-ribbed, the lower ovate or oval, upper lanceolate; flowers rather large, clustered; petals pale rose-color or almost white, notched at the end. The double-flowered is most common. 2

6. GYPSÓPHILA. (From Greek words meaning lover of *gypsum* or *chalk*, growing on calcareous rocks.) Plants with the small and often panicled flowers and foliage of Arenaria or Stellaria, but the sepals united into a cup as in the true Pink Family, usually by their thin white edges, however, so that to a casual glance they may appear distinct. Cult. in choicer gardens, from Eu. and the East, ornamental, especially for dressing cut flowers, &c. Fl. all summer.

G. paniculàta, PANICLED G. Very smooth, pale, 1° – 2° high; with lance-linear leaves, and branches repeated forking into very loose and light cymes, bearing innumerable very small and delicate white flowers. 2

G. élegans, ELEGANT G. Less tall or low, loosely spreading; with lanceolate leaves, much larger (½′ broad) and fewer flowers, white or slightly rosy. ①

7. SAGÌNA, PEARLWORT. (Latin name, means *rich nourishment*, which, however, these small and insignificant plants can hardly be.) There are four or five species in the country, none very common; the most so is

S. procúmbens. Springy places and damp shores, &c., N.; a smooth little plant, tufted and spreading, 1′–3′ high, with almost thread-shaped leaves; the blunt sepals, short white petals, stamens, and styles 4 or rarely 5.

8. CERÁSTIUM, MOUSE-EAR CHICKWEED. (Name in Greek refers to the horn-shaped pod of some species. The popular name is from the shape and soft hairiness of the leaves of the common species.)

* *Flowers inconspicuous, the deeply 2-cleft petals being shorter or little longer than the calyx; the pods becoming much longer and curving more or less. Flowering all summer, white.*

C. vulgàtum, COMMON M., from Penn. S., but scarce N., in grassy places. An insignificant soft-hairy weed; stems erect, 4′–9′ high, slightly clammy; leaves ovate or obovate, small; pedicels even in fruit and petals shorter than the calyx. ①

C. viscòsum, CLAMMY M. Common in grassy places; stems spreading, 6′–15′ long, clammy-hairy; leaves oblong; pedicels becoming longer than the calyx; petals as long as the calyx. ② 2ℓ

C. nùtans, NODDING-FRUITED M. Common in moist or shady grounds, wild. Clammy-pubescent, erect, 6′–18′ high, becoming very loosely-flowered and branched; leaves oblong-lanceolate; petals longer than calyx; pods long, nodding on the slender flower-stalk and curved upwards. ①

* * *Flowers conspicuous, the snowy white petals 2 or 3 times the length of the calyx: pod shorter: plants forming matted tufts.* 2ℓ

C. arvénse, FIELD M. Dry fields, &c. Downy but green; leaves varying from narrow-oblong to linear; flowering stems 4′–6′ high, few-flowered; petals notched at the end.

C. tomentòsum, COTTONY M. Cult. from Eu. for borders, &c., its spreading shoots, crowded with oblong white-woolly leaves, making dense silvery mats; petals deeply 2-cleft.

9. STELLÀRIA, STARWORT-CHICKWEED. (Name from Latin *stella*, a star.) Petals white, but sometimes small or none. Fl. spring and summer. None cultivated; but the first is a weed in every garden.

* *Stems weak and spreading, marked with pubescent lines: leaves broad.*

S. mèdia, COMMON S. or CHICKWEED. In all damp cult. grounds; leaves ovate or oblong, the lower on hairy petioles; petals shorter than the calyx, 2-parted; stamens 3–10. ①

S. pùbera, GREAT S. Shaded rocks, wild from Penn. S. & W.; leaves oblong or oval, sessile; petals longer than the calyx, 2-cleft.

* * *Stems erect or spreading, and whole plant smooth: leaves narrow, sessile.* 2ℓ

S. longifòlia, LONG-LEAVED S. or STITCHWORT. Common in damp grassy places N.; stem weak, 8′–18′ high; leaves linear, widely spreading; flowers numerous on slender spreading pedicels in a very loose cyme; petals 2-parted, longer than the calyx.

S. boreàlis, NORTHERN S. Wet grassy places N.; stem 3′–10′ high, forking repeatedly and with flowers in the forks of the leafy branches; leaves broadly lanceolate or narrow-oblong; petals shorter than the calyx, or none.

10. ARENÀRIA, SANDWORT. (So named because several grow in sand or sandy soil.) All the following are wild, also some others less common. Fl. spring and summer.

* *Petals inconspicuous, white.*

A. serpyllifòlia, THYME-LEAVED S. An insignificant little weed, in sandy or gravelly waste places, 2′–6′ high; stems erect, roughish, much branched; leaves ovate, pointed; petals scarcely longer than the 3–5-nerved pointed sepals. ①

A. diffùsa, SPREADING S. Shady grounds S. Plant soft-downy; stems prostrate, 1° or more long; leaves lanceolate; peduncles lateral, 1-flowered; petals shorter than the sepals or none. ♃

* * *Petals conspicuous, longer than the calyx, white.* ♃

A. lateriflòra, SIDE-FLOWERING S. Gravelly shores and banks N. Plant minutely downy; stem erect, 3′–10′ high, sparingly branching; peduncles few-flowered, soon becoming lateral by the farther growth of the leafy stem; leaves oval or oblong.

A. stricta. Rocky or shady banks N. Tufted, smooth, 4′–6′ high; stems crowded with slender almost bristle-form leaves; flowers several in a terminal open cyme; sepals sharp-pointed.

A. squarròsa, PINE-BARREN S. In sand, coast of New Jersey and S. Densely tufted on a deep root, 3′–5′ high; leaves much crowded, short, awl-shaped, smooth; the flowering branches or few-flowered peduncles glandular; sepals obtuse.

A. Grœnlándica, MOUNTAIN S. On rocky summits of mountains and N. E. coast. Densely tufted, soft; leaves thread-form; flowering stems 2′–4′ high, few-flowered, the flowers large in proportion; petals notched at the end.

A. peploides, SEA SANDWORT, in sands of sea-shore N., is large, with very fleshy ovate leaves, and axillary flowers.

11. SPERGULÀRIA, SAND SPURREY. (Name from likeness to *Spergula.*) A sort of Sandworts with scaly-membranaceous stipules, and reddish flowers, produced all summer: chiefly maritime. ① ♃ ?

S. rùbra. The field form of this is common in sand or gravel, along roads and paths, E., quite away from salt water; smoothish, prostrate in tufts; leaves thread-shaped; pod and pink-red corolla hardly exceeding the calyx; seeds rough, wingless, half-obovate.

S. salina. Larger and more fleshy, only in brackish sands; with short peduncles, pale corolla, pod longer than the calyx, and rough obovate-rounded (winged or wingless) seeds.

S. mèdia. Like the last, in salt marshes and sands, but with longer peduncles and smooth seeds.

12. SPÉRGULA, SPURREY. (Latin *spargere,* to scatter, i. e. its seeds.)

S. arvénsis, CORN S. Stems 1° or so high; bearing several thread-shaped leaves in the whorls, and terminating in a panicle of white flowers. A weed in grain-fields, cult. in Europe as a forage plant, sheep being fond of it: fl. summer. ①

13. ANÝCHIA FORKED CHICKWEED. (Name of obscure meaning.) ①

A. dichótoma, a common little herb; in shady places it is smooth and erect, 6′–10′ high, with repeatedly forking long-jointed very slender stems, minute short-stalked greenish flowers in the forks, and oval or oblong leaves: in dry or parched soil it is spreading on the ground, short-jointed, narrower-leaved, often pubescent, the flowers more clustered and nearly sessile: all summer.

14. SCLERÁNTHUS, KNAWEL. (From Greek words meaning *hard* and *flower,* referring to the indurated tube of the calyx.)

S. ánnuus, our only species, is nat. from Eu. in gravelly grounds, around gardens, &c., a very pale little herb, 3′–5′ high, very much branched and spreading, with short awl-shaped leaves, and greenish small flowers clustered or sessile in the forks, in late summer and autumn.

15. MOLLÙGO, CARPET-WEED. (An old Latin name for some soft plant.) ①

M. verticillàta. A very common, small, prostrate and spreading little weed, in waste gravelly soil, gardens, &c., with spatulate leaves and 1-flowered pedicels in clusters or whorls at the joints; the sepals white inside; stamens 3: fl. all summer.

21. PORTULACACEÆ, PURSLANE FAMILY.

Succulent-leaved herbs, with 2 sepals and 5 petals, the stamens sometimes many, sometimes few, and then one before each petal; ovary 1-celled, becoming a pod, with many or few kidney-shaped seeds on a central placenta, or on slender seed-stalks from the base. Seeds as in the Pink Family.

1. PORTULACA. Stamens more numerous than the petals. Style cleft into several slender divisions. Lower part of the ovary and many-seeded pod united with the bottom of the calyx; the upper part when mature falling off as a lid. Flowers opening only once, in sunshine.
2. TALINUM. Stamens more numerous than the petals. Style 3-lobed at the summit. Calyx free from the ovary, deciduous. Pod 3-valved, many-seeded. Flowers opening only once, in sunshine.
3. CALANDRINIA. Stamens numerous. Style 3-cleft at the summit. Calyx free from the ovary, persistent, enclosing the 3-valved many-seeded pod. Flowers opening only once, in sunshine.
4. CLAYTONIA. Stamens 5, one attached to the base of each petal. Style 3-cleft at the summit. Calyx persistent, free from the few-seeded pod. Flowers usually opening for more than one day.

1. PORTULÀCA, PURSLANE. (Old Latin name for Purslane.) Leafy and branching, low and spreading, with fleshy sessile leaves; fl. all summer. (Lessons, p. 95, fig. 272, and p. 124, fig. 404.) ①

P. oleràcea, COMMON P. Very smooth, with prostrate stems, obovate or wedge-form leaves, and small sessile flowers opening only in bright sunshine and for a short time; the petals pale yellow. The commonest garden weed, sometimes used as a pot-herb.

P. pilòsa, HAIRY P. Wild far S., has linear terete leaves, with a tuft of beard-like hairs in the axils, and rather large pink flowers.

P. grandiflòra, GREAT-FLOWERED P., is probably a variety of the last, from South America, commonly cult. for ornament; the large very showy flowers brilliant purple, crimson, red, sometimes white or yellow, or with light centre, of many shades or variations.

2. TALÌNUM. (Name unexplained.) One wild species in some places.

T. teretifòlium, TERETE-LEAVED T. Low and smooth, with thick and fleshy root, short stems bearing crowded linear terete leaves, and a slender naked peduncle, many-flowered; petals rose-purple. Serpentine rocks, Pennsylvania, and rarer west and south: fl. all summer. 2

3. CALANDRÍNIA. (Named for a Swiss botanist, *Calandrini.*) Cultivated for ornament in choice gardens: fl. all summer.

C. díscolor. Cult. as an annual, from Chili; very glabrous, making a rosette of fleshy spatulate leaves at the root (these glaucous above and tinged with purple beneath), and sending up a naked flower-stem, bearing a raceme of large rose-purple flowers, 2′ in diameter.

C. Menzièsii, MENZIES' C. Low, spreading, leafy-stemmed annual, from Oregon and California, with bright green and tender lance-spatulate leaves, and crimson flowers (nearly 1′ broad) in a short leafy raceme.

4. CLAYTÒNIA, SPRING BEAUTY. (Named for *John Clayton,* an early botanist in Virginia.) Low, smooth herbs: ours producing only a pair of stem leaves and a short raceme of flowers.

* *Stem simple from a round tuber: leaves separate: fl. early spring.* 2

C. Virgínica, NARROW-LEAVED S. In moist woods, one of the prettiest spring flowers; petals rose-color with pink veins; leaves linear-lanceolate.

C. Caroliniàna, BROADER-LEAVED S. In rich woods; commonest N. and along the Alleghanies, smaller than the other, with oblong-spatulate or lance-oblong leaves only 1′ or 2′ long.

* * *Stem-leaves united into one usually rounded blade or cup underneath the small and whitish flowers: fl. summer.* ①

C. perfoliàta occurs in some gardens, from Oregon and California; small, of no beauty; root-leaves tufted, spatulate or lanceolate.

22. MALVACEÆ, MALLOW FAMILY.

Known by the monadelphous numerous stamens, their tube connected with the base of the petals, kidney-shaped 1-celled anthers (Lessons, p. 102, fig. 298), the calyx valvate and the corolla convolute in the bud. Herbs or shrubs, with alternate palmately-veined and often lobed leaves, evident stipules, and regular flowers, the true sepals and the petals 5. There is commonly an involucre of several bracts, resembling an outer calyx. Seeds kidney-shaped: the leafy cotyledons crumpled or doubled up, in some mucilaginous albumen. Innocent plants, mucilaginous, with a very tough fibrous bark.

§ 1. *Anthers all borne in a cluster at the top of the short tube of filaments.*

* *Ovaries numerous and separate, crowded in a head, in fruit becoming little* 1*-seeded pods or akenes. Involucre conspicuous as a sort of outer calyx. Herbs.*

1. MALOPE. Involucre of 3 ovate or heart-shaped leaves. Annuals.
2. KITAIBELIA. Involucre of 6 – 9 ovate and pointed leaves united at the base. Perennial.

* * *Ovaries several or many united in a ring around an axis, in fruit commonly falling away separately, each* 1*-seeded. Ours are all herbs.*

+– *Stigmas running down the side of the slender styles.*

3. ALTHÆA. Involucre of 6 – 9 bracts united at the base. Axis of the fruit not projecting nor enlarged.
4. LAVATERA. Involucre of 3 – 6 more united bracts. Axis of the fruit overtopping the carpels.
5. MALVA. Involucre of only 3 separate bracts. Petals obcordate, otherwise entire. Carpels beakless.
6. CALLIRRHOE. Involucre of 1 – 3 bracts or none. Petals wedge-shaped and truncate, denticulate or cut-fringed at the end. Carpels with a sort of beak at the summit.
7. NAPÆA. Involucre none. Flowers diœcious!

+– +– *Stigmas capitate or truncate at the apex of the styles.*

8. ANODA. Involucre none. Fruit depressed, very flat and star-shaped, the sides of the numerous carpels evanescent: seed nearly horizontal.
9. SIDA. Involucre none. Fruit separating into 5 or more closed carpels, or each 2-valved at the apex: seed hanging.

* * * *Ovaries and cells of the fruit* 2 *– several-seeded.*

10. ABUTILON. Involucre none. Carpels each 3 – several-seeded.
11. MODIOLA. Involucre of 3 bractlets. Carpels each 2-seeded, with a cross partition between the upper and lower seed.

§ 2. *Anthers borne along the outside of the tube of filaments. Ovary and fruit* 3 *– several-celled: stigmas capitate. Involucre present. Herbs, shrubs, or trees.*

* *Involucre of several or many bracts.*

12. MALVAVISCUS. Branches of the style and stigmas 10, twice as many as the cells of the ovary. Petals not separating and spreading. Fruit berry-like: cells 1-seeded.
13. KOSTELETZKYA. Branches of the style and stigmas 5. Pod 5-celled; the cells single-seeded.
14. HIBISCUS. Branches of the style or stigmas and cells of the ovary 5. Pod 5-celled, loculicidal; the cells many-seeded.

* * *Involucre of* 3 *large and heart-shaped leaf-like bracts.*

15. GOSSYPIUM. Styles united into one: stigmas 3 – 5, as many as the cells of the pod. Seeds numerous, bearing cotton.

1. MÁLOPE. (Ancient Greek name for some kind of Mallow.) Herbs, resembling Mallows, from the Mediterranean region; cult. as garden annuals: fl. summer.

M. trífida, THREE-LOBED M. Smooth, with rounded leaves, the upper ones 3-lobed; the handsome flowers 2′ or more broad, rose-color, veined with purple or rose-red, also a white var. ①

M. malacoìdes is rarer, hairy, low, with oblong-ovate toothed leaves, long peduncles, and rose-colored flowers. ♃

2. KITAIBÈLIA. (Named for *Paul Kitaibel*, a botanist of Hungary, where the plant grows wild.) Fl. summer. The only species is

K. vitifòlia, VINE-LEAVED K. Cult. in gardens; a rough-hairy herb, 2°–3° high, rather clammy at the summit, with acutely 5-lobed and toothed leaves, involucre longer than the true calyx, and dull white corolla 1½′ broad when expanded. ♃

3. ALTHÆA. (From Greek word meaning *to cure*, used in medicine as an emollient.) Tall herbs (the *Shrubby Althæa* belongs not to this genus, but to Hibiscus), natives only of the Old World: fl. summer and autumn.

A. officinàlis, MARSH-MALLOW. Rarely cult., but has run wild on the coast E.; a rather coarse downy plant, with ovate, sometimes a little heart-shaped or 3-lobed leaves, and clusters of short-peduncled flowers in their axils; corolla 1′ broad, rose-color. The thick root is used for its mucilage, and for making *Marsh-Mallow paste.* ♃

A. ròsea, HOLLYHOCK. Cult. from Syria, with tall and simple hairy stem, rugose rounded and heart-shaped angled or 5–7-lobed leaves, and large flowers on very short peduncles, forming a long spike; corolla of all shades of rose, purple, white, or yellow, single or double, 3′–4′ broad. ②

4. LAVÁTERA. (Named for the brothers *Lavater*, of Zurich.) A sort of Mallow, sometimes cult. in gardens, from Europe: fl. all summer.

L. triméstris, THREE-MONTH L. or FLOWERING MALLOW. Smooth or smoothish, 1°–2° high; lower leaves round-kidney-shaped, crenate, upper heart-shaped, uppermost 3-lobed; flowers 2′–3′ broad, rose-color, rarely white; in fruit a broad disk-shaped or umbrella-like expansion of the top of the axis completely covers the carpels. ①

L. Thuringìaca. GERMAN L. Rather downy, smaller; leaves mostly 3-lobed; flowers long-peduncled, 1½′–2′ broad, rose-color; in fruit the axis projects much beyond the ring of carpels as a pointed cone. ♃

L. arbòrea, TREE MALLOW. Not quite hardy N., has a stout stem 2°–6° high, woody below, rounded 5–9-lobed rather downy leaves, pale purple flowers 1½′ broad, on short pedicels, in a terminal raceme or narrow panicle; the axis of the fruit (like that of Mallow) not projecting beyond the carpels. ♃

5. MÁLVA, MALLOW. (Latin alteration of an old Greek word, meaning *soft* or *emollient.*) All from Europe or the Orient, but several have run wild in fields and along roadsides: fl. all summer and autumn.

* *Flowers small, white or whitish, not conspicuous nor handsome.*

M. rotundifòlia, COMMON or ROUND-LEAVED M. Weed in cult. grounds; with procumbent stems from a strong deep root, rounded kidney shaped crenate leaves on very long petioles, rather slender peduncles, and fruit not wrinkled. ② ♃

M. críspa, CURLED M. In country gardens, rarely in waste places; with erect stem (4°–6° high) leafy to the top, rounded 5–7-lobed or angled leaves very much crisped round the margin, flowers clustered and almost sessile in the axils, and fruit slightly wrinkled. ①

* * *Flowers larger, more or less showy, 1½′–2′ in diameter; the purple, rose-color, or sometimes white petals much exceeding the calyx: stem erect.*

M. Mauritiàna, sometimes called TREE MALLOW. Cult.; 3°–5° high, with rounded 5-lobed smooth or smoothish leaves, and clusters in their axils of

flowers $1\frac{1}{2}'$ in diameter, the petals pale rose-color or white, striped with dark purple or violet veins. ①

M. sylvéstris, HIGH M. Gardens and roadsides; 2° – 3° high, branching, with rather sharply 5 – 7-lobed leaves, and purple-rose-colored flowers rather smaller than in the last; fruit wrinkled-veiny. ② ♃

M. Alcea. Gardens; 2° – 4° high, hairy, with stem-leaves parted almost to the base into 3 – 5 divisions which are again 3 – 5-cleft or cut-toothed; and showy flowers in clusters or terminal racemes; corolla deep rose-color, $1\frac{1}{2}' - 2'$ broad; fruit smooth, minutely wrinkled-veiny. ♃

M. moschàta, MUSK M. Gardens, and escaped to roadsides, 1° – 2° high, rather hairy, with the herbage faintly musk-scented, leaves about thrice parted or cut into slender linear lobes, and short-peduncled flowers somewhat clustered or racemed; corolla $1\frac{1}{2}'$ broad, rose-color or white; fruit downy.

6. CALLÍRRHOË. (A Greek mythological name, applied to N. American plants.) Species chiefly farther W. and S., becoming rather common in choice gardens. Flowers crimson, mauve, or red-purple, very showy, produced all summer.

* *Root thick, often turnip-shaped, farinaceous: stems roughish-hairy or smoothish.* ♃

C. triangulàta. Dry prairies from Wisconsin S.; stems erect, 2° high; leaves triangular, halberd-shaped, or the lowest heart-shaped, the upper cut-lobed or 3 – 5-cleft; flowers somewhat panicled and short-peduncled; involucre as long as the calyx; corolla $1\frac{1}{2}'$ or less in diameter; carpels of the fruit even on the back, tipped with a short point.

C. involucràta. Wild from plains of Nebraska S., and cult. for ornament; stems spreading on the ground, 1° – 3° long; stipules conspicuous; leaves rounded, 5-parted or cleft and cut-lobed, shorter than the axillary peduncles; involucre shorter than the calyx; corolla 2′ or more broad; carpels of the fruit reticulated, tipped with a flat and inconspicuous beak.

C. Papàver. Wild in rich woodlands from Georgia to Texas, and sparingly cult.; stems short, ascending, few-leaved; leaves 3 – 5-parted with lance-linear divisions, or the lowest rather heart-shaped and cleft into oblong lobes; axillary peduncles very (often 1°) long; involucre of 1 – 3 bracts or none; corolla 2′ or more broad; carpels of the fruit wrinkled or reticulated and with a stout incurved beak.

C. digitàta. Wild in prairies of Arkansas and Texas; 1° high; leaves mostly from the root, 5 – 7-parted into long linear sometimes 2 – 3-cleft divisions; peduncles long and slender; involucre none; corolla $1\frac{1}{2}' - 2'$ broad, the petals fringe-toothed at the end; fruit nearly as in the last.

* * *Root slender or tapering: herbage smooth.* ① ②

C. pedàta. Wild in E. Texas; not rare cult.; stem erect, 1° – 5° high, leafy; leaves rounded, 3 – 7-lobed or parted and the wedge-shaped divisions cleft or cut; peduncles slender, longer than the leaves; involucre none; corolla about $1\frac{1}{2}'$ broad, the petals minutely eroded at the end; carpels of the fruit smooth and even on the back, and with a stout conspicuous beak.

7. NAPÆA, GLADE-MALLOW. (From Greek name for *glade* or *nymph of the groves.*) Only one species,

N. dioìca. In valleys, chiefly in limestone districts of Penn., Virginia, and W. A rather coarse, roughish herb; stem 4° – 7° high; leaves 9 – 11-parted and their lobes cut and toothed, the lowest often 1° in diameter; flowers small, in panicled corymbs, in summer.

8. ÁNODA. (Origin of the name obscure.) Low herbs from Mexico, Texas, &c., sparingly cult. for ornament. Stems, &c. hirsute: peduncles long and slender, 1-flowered. Fruit in the form of a many-rayed star, supported by the spreading 5-rayed calyx: when ripe the rim of each carpel falls away with the seed it embraces, the sides or partitions disappearing. ①

A. hastàta has mostly halberd-shaped leaves, and blue or violet corolla only $1' - 1\frac{1}{2}'$ in diameter; lobes of the calyx ovate, scarcely pointed.

A. cristàta has mostly triangular or obscurely halberd-shaped and toothed leaves, and purple or rose-colored corolla 2′ in diameter; lobes of the calyx triangular, taper-pointed.

9. SÌDA. (Ancient name, of obscure meaning.) Mostly rather small-flowered or weedy herbs, with 5–12 styles and carpels: fl. summer and autumn.

* *Peduncles axillary, 1-flowered: corolla yellow.*

S. spinòsa. So named from the little pointed projection or tubercle at the base of the petiole, but which can hardly be called a spine; stems much branched, 10′–20′ high; leaves lance-ovate, serrate, minutely soft-downy; peduncles very short; flower very small; pod ovate, of 5 carpels, each splitting at top into 2 points. A common weed S. of New York. ①

S. rhombifòlia. But the leaves are hardly rhombic, usually lance-oblong, short-petioled, serrate, pale and whitish downy beneath; stems 1°–3° high, much branched; peduncles rather long; flower small; fruit of 10 or 12 one-pointed carpels. A weed only S. ①

S. Ellióttii. Nearly smooth, 1°–4° high; leaves linear or lanceolate, serrate, short-petioled; flower 1′ broad, on a short peduncle; fruit of 10–12 nearly blunt carpels. Woodlands S. ♃

* *Peduncles bearing a corymb of several white flowers from the upper axils.*

S. Napæa. Smooth; stem simple, 4°–7° high; leaves rounded, 5-cleft, the lobes toothed and taper-pointed; corolla about 1′ broad; styles and cells of the pod 10. Wild in S. Penn. and Virg. Cult. in old gardens. ♃

10. ABÙTILON, INDIAN MALLOW. (Origin of name obscure.) Resembles Sida, but cells more than one-seeded; flowers usually larger.

A. Avicénnæ, VELVET-LEAF. Cult. soil and old gardens, 3°–5° high; leaves roundish heart-shaped, taper-pointed, soft-velvety; peduncles shorter than petiole, 1–3-flowered; corolla orange-yellow; fruit of 12–15 united hairy carpels with spreading beaks. Fl. autumn. ①

A. striàtum, STRIPED ABUTILON. Cult. in greenhouses, &c. from Brazil; a tall shrub, very smooth, with rounded heart-shaped 3-lobed leaves, the lobes very taper-pointed, and pretty large solitary flowers hanging on a very long and slender peduncle; corolla not spreading open, orange-colored, with deeper or brownish veining or stripes.

11. MODÌOLA. (The shape of the depressed fruit likened to the Roman measure *modiolus*.) Procumbent or spreading, small-flowered, weedy plants.

M. multífida. Virginia and S., in low grounds; leaves 3–7-cleft and cut, or the earlier ones rounded and undivided; flowers red, ½′ broad; fruit hairy at the top. ② ♃

12. MALVAVÍSCUS. (Name composed of *Malva*, Mallow, and *viscus*, birdlime, from the glutinous pulp of the berry-like fruit.) Shrubby plants, with showy scarlet flowers, of peculiar appearance, the petals not expanding, but remaining convolute around the lower part of the slender projecting and soon twisted column, held together as it were by a little side-lobe near the base of the inner edge.

M. arbòreus, the common West India species, cult. in some hot-houses, has heart-shaped leaves longer than broad, and yellowish fruit.

M. Drummóndii, of Texas, if housed in winter flowers all summer in open ground, is soft-downy, with more rounded and somewhat 3-lobed leaves, and scarlet fruit.

13. KOSTELÉTZSKYA. (Named for a Bohemian botanist, *Kosteletzsky*.) Like Hibiscus, only the cells of ovary and fruit 1-seeded. Fl. summer.

K. Virgínica, VIRGINIAN K. In and near salt marshes, from New York and New Jersey S.: roughish-hairy, 2°–5° high; leaves heart-shaped or mostly 3-lobed, often halberd-shaped; flowers somewhat racemed or panicled, rose-purple, 1′–2′ broad. ♃

14. HIBÍSCUS, ROSE-MALLOW. (Ancient name, of obscure origin.) Flowers showy, usually large, in summer and autumn.

* *Tall shrubs or even trees, exotics.*

H. Syrìacus, Tree H. or Shrubby Althæa, of gardens and grounds, common, native of the Levant: nearly smooth, with wedge-ovate and 3-lobed leaves, and short-peduncled flowers in their axils, in autumn, about 3′ broad, purple, rose-color, white, &c., often double.

H. Rosa-Sinénsis. China H. or Rose of China. Cult. in conservatories, from East Indies (where the splendid corollas, which stain black, are used to black shoes): very smooth, with bright green ovate and pointed somewhat toothed leaves, and very showy flowers on slender peduncles, 4′ or 5′ broad, scarlet-red (rarely rose-purple or even white), often double.

* * *Herbs, with persistent and regular 5-lobed calyx, and a short pod.*

+– *Wild species, but sometimes cultivated, tall and large.* 2

H. coccíneus, Great Red H. or Rose-Mallow. Marshes from Carolina S.; very smooth, 4° – 7° high, with leaves 5-parted or deeply cleft into long lanceolate and taper-pointed divisions, and bright-red corolla 6′ – 11′ broad, the petals narrowed below.

H. militàris, Halberd-leaved R. Low grounds from Pennsylvania and Illinois S.; smooth, 3° – 4° high, with ovate or heart-shaped toothed or 3-lobed leaves, some of them halberd-shaped, and slender-peduncled flowers, with inflated calyx, and flesh-colored corolla 4′ – 5′ broad.

H. Moscheùtos, Swamp R. Common in brackish marshes and up the larger rivers; 3° – 7° high, soft-downy; the ovate pointed and often 3-lobed leaves hoary beneath, generally smooth above; peduncles slender; corolla 4′ – 6′ broad, pale rose or white, with or without a darker centre; pod smooth.

H. grandiflòrus, Large-fl. R. Swamps, from Illinois and Carolina S.; like the last, but leaves soft-downy both sides, and pod velvety-hairy.

H. aculeàtus, Prickly or Rough R. Swamps only S.; rough with stiff bristles and bristly points, 2° – 6° high; leaves 3 – 5-cleft and the divisions mostly toothed; flowers short-peduncled; leaves of the involucre often forked; corolla yellow with a purple centre, 4′ broad; pod bristly.

+– +– *Exotic low species, in gardens or cultivated grounds.* ①

H. Triònum, Bladder Ketmia or Flower-of-an-hour. Rather hairy, 1° – 2° high, with the leaves toothed, or the upper 3-parted into lanceolate lobes, the middle lobe much longest; calyx inflated and bladdery; corolla about 2′ broad, sulphur-yellow with a blackish eye, open only in midday sunshine.

* * * *Herbs, with calyx splitting down one side, and generally falling off at once, and with long or narrow pyramidal or angled pod: natives of East Indies.*

H. esculéntus, Okra or Gumbo. Nearly smooth, with rounded heart-shaped 5-lobed toothed leaves, greenish-yellow flowers on slender peduncle (involucre falling early), and narrow pods 3′ or 4′ long, which are very mucilaginous, and when green cooked and eaten, or used to thicken soups: cult. S. ①

H. Mánihot. Smoothish, with leaves 5 – 7-parted into long narrow divisions; the large and showy corolla pale yellow with a dark eye; the leaves of the involucre hairy and soon falling off: introduced or cult. S. W. 2

15. GOSSÝPIUM, COTTON. (Name given by Pliny, from the Arabic.) Plants now diffused over warm countries, most valuable for the wool on the seeds: the species much mixed up.

G. herbàceum, Common Cotton. Cult. S. Leaves with 5 short and roundish lobes; petals pale yellow or turning rose-color, purple at base. ①

G. Barbadénse, Barbadoes or Sea-Island C. Cult. on the coast S. Inclining to be shrubby at base; branches black-dotted; leaves with 5 longer lance-ovate and taper-pointed lobes; leaves of the involucre with very long and slender teeth; petals yellowish or whitish with purple base.

G. arbòreum, Tree C. Cult. S., only for curiosity, has 5 – 7 nearly lanceolate and taper-pointed lobes to the leaves, leaves of involucre slightly toothed, and a purple corolla with a darker centre.

23. STERCULIACEÆ, STERCULIA FAMILY.

Chiefly a tropical family, to which belongs the THEOBROMA or CHOCOLATE-TREE; in common cultivation known here only by a single species of

1. MAHÉRNIA. (Name an anagram of *Hermannia*, a genus very like it.) Calyx, corolla, &c. as in the Mallow Family; but the stamens only 5, one before each petal; the filaments monadelphous only at the base and enlarged about the middle, and the anthers with 2 parallel cells. The edges of the base of the petals rolled inwards, making a hollow claw. Ovary 5-celled, with several ovules in each cell: styles 5, united at the base.

M. verticillàta. Cult. from Cape of Good Hope, in conservatories producing a succession of honey-yellow sweet-scented small blossoms, on slender peduncles, all winter and spring; a sort of woody perennial, with slender and spreading or hanging roughish branches and small green irregularly pinnatifid leaves; the specific name given because the leaves seem to be whorled; but this is because the stipules, which are cut into several linear divisions, imitate leaves.

24. TILIACEÆ, LINDEN FAMILY.

Chiefly a tropical family, represented here only by an herbaceous CORCHORUS on our southernmost borders, and by the genus of fine trees which gives the name.

1. TÍLIA, LINDEN, LIME-TREE, BASSWOOD. (The old Latin name.) Sepals 5, valvate in the bud, as in the Mallow Family, but deciduous. Petals 5, imbricated in the bud, spatulate-oblong. Stamens numerous; their filaments cohering in 5 clusters, sometimes with a petal-like body in each cluster; anthers 2-celled. Pistil with a 5-celled ovary, having 2 ovules in each cell, in fruit becoming a rather woody globular 1 – 2-seeded little nut. Style 1: stigma 5-toothed. Embryo with a slender radicle and leaf-like lobed cotyledons folded up in the albumen. Trees with mucilaginous shoots, fibrous inner bark (*bast*), soft white wood, alternate roundish and serrate leaves more or less heart-shaped and commonly oblique at the base, deciduous stipules, and a cyme of small, dull cream-colored, honey-bearing flowers, borne in early summer on a nodding axillary peduncle which is united to a long and narrow leaf-like bract.

* *A petal-like scale before each petal, to the base of which the stamens are joined.*

T. Americàna, AMERICAN LINDEN or COMMON BASSWOOD. A handsome and large forest-tree, with leaves of rather firm texture and smooth or smoothish both sides, or in one variety thinner and more downy but not white beneath.

T. heterophýlla, WHITE LINDEN. Along the Alleghany region from Penn. and Kentucky S.; has larger leaves silvery white with a fine down underneath.

* * *No scales with the stamens. Natives of Europe.*

T. Europæa, EUROPEAN L., embraces both the SMALL-LEAVED variety, which is commonly planted about cities, and the LARGE-LEAVED or DUTCH L., with leaves as large and firm as those of our wild Basswood.

25. CAMELLIACEÆ, CAMELLIA or TEA FAMILY.

Trees or shrubs, with alternate and simple feather-veined leaves, and no stipules; the flowers large and showy, mostly axillary, reguiar, with both sepals and petals imbricated in the bud; the very numerous stamens with filaments more or less united at the base with each other and with the base of the corolla: anthers 2-celled: ovary and thick or woody pod 5-celled, with one or more seeds in

each cell. The petals themselves are commonly more or less united at their base; they are 5 or sometimes 6 or even more in number in natural flowers, and in cultivated plants apt to be increased by doubling.

* *Exotics, from China, Japan, &c.: some of the inner stamens entirely separate: commonly there is a gradation from bracts to sepals and petals.*

1. CAMELLIA. Numerous separate inner stamens within the ring or cup formed by the united bases of the very numerous outer stamens. Style 3 – 5-cleft. Seeds large, usually single in each cell of the thick and woody pod. Leaves evergreen, serrate.
2. THEA. Separate interior stamens only as many as the petals (5 or 6): otherwise nearly like Camellia: flowers less showy; bracts under the calyx inconspicuous.

* * *Natives of Southeastern States: stamens all united at the base.*

3. GORDONIA. Stamens in 5 clusters, one attached to the base of each petal. Style columnar: stigma 5-rayed. Seeds several, more or less winged. Leaves coriaceous or thickish.
4. STUARTIA. Stamens uniformly united by a short ring at the base of the filaments. Seeds 2 in each cell, wingless. Leaves thin and deciduous.

1. CAMÉLLIA. (Named for *G. Camellus* or *Kamel*, a missionary to China in the 17th century.)

C. Japónica, JAPAN CAMELLIA, with oval or oblong pointed and shining leaves, and terminal or nearly terminal flowers, simple or double, red, white, or variegated, of very many varieties, is the well-known and only common species; fl. through the winter, hardy only S.

2. THÈA, TEA-PLANT. (The Chinese name.) Genus too slightly different from Camellia. Shrubs, natives of China and Japan, sparingly cult. for ornament.

T. víridis, GREEN or COMMON T. Leaves oblong or broadly lanceolate, much longer than wide; the white flowers (1′ or more broad) nodding on short stalks in their axils.

T. Bohèa, BOHEA T. Leaves smaller and broader in proportion; probably a mere variety of the other.

3. GORDÒNIA. (Named for *Dr. Gordon* and another Scotchman of the same name.)

G. Lasiánthus, LOBLOLLY BAY. A handsome shrub or small tree, in swamps near the coast from Virginia S., with evergreen and smooth lance-oblong leaves tapering to the base and minutely serrate, and showy white flowers 2′ – 3′ across, in spring and summer, on a slender peduncle; the stamens short, on a 5-lobed cup.

G. pubéscens, also called FRANKLÍNIA, after *Dr. Franklin.* Grows only in Georgia and Florida; a tall, ornamental shrub or small tree, with thinner and deciduous leaves whitish downy beneath, as are the sepals and (white) petals, and longer style and filaments, the latter in 5 distinct parcels one on the base of each petal.

4. STUÁRTIA. (Named for *John Stuart*, the *Lord Bute* at the time of the American Revolution.) Ornamental shrubs, with thin leaves and handsome white flowers 2′ or 3′ across, in late spring or early summer, wild in shady woods of Southern States.

S. Virgínica, grows in the low country from Virginia S.; shrub 8° – 12° high, with finely serrate leaves soft-downy underneath, pure white petals, purple stamens, one style, and a roundish pod.

S. pentágyna, belongs to the mountains S. of Virginia, and in cult. is hardy N.; has smoother leaves and rather larger very handsome flowers, their petals jagged-edged and tinged with cream-color, the sepals often reddish outside, 5 separate styles, and a 5-angled pointed pod.

26. LINACEÆ, FLAX FAMILY.

A small family, represented here only by the main genus,

1. LÍNUM, FLAX. (The classical Greek and Latin name.) Flowers (see Lessons, p. 14, fig. 9 and 10 and p. 98, fig. 281) usually opening for only one day, and in sunshine, regular and symmetrical; the persistent sepals, deciduous petals, slightly monadelphous stamens, and mostly the styles 5, but the latter are sometimes fewer, occasionally partly united: ovary and pod with as many 2-seeded cells as there are styles, or mostly twice as many and one-seeded, each cell being divided more or less by a false partition. Seeds with a mucilaginous coat and a large straight oily embryo. Leaves simple, nearly sessile, and entire. Fl. all summer.

* *Wild species, annuals or scarcely perennials, with small yellow flowers.*

L. Virginiànum, the commonest WILD FLAX, in dry woods, 2° high, with spreading or recurving terete branches at the summit of the stem; the leaves oblong or lanceolate, only the lower spatulate and opposite; flowers scattered; styles separate; pod little larger than a pin's head.

L. striàtum, also common, mostly in boggy grounds, like the first; but has the branches shorter, scattered along the stem, and sharply 4-angled with intermediate grooves (whence the name); most of the stem-leaves opposite and oblong; flowers more crowded.

L. sulcàtum, much less common, in dry soil, also has grooved (upright) branches, but the leaves are linear and scattered; flowers and pods twice as large; sepals sharp-pointed, 3-nerved and with rough glandular margins; styles united half-way up.

* * *Cultivated, hardy, herbaceous, with* 5 *styles and largish handsome flowers.*

L. usitatíssimum, COMMON FLAX. Cult. from Old World, and inclined to run wild in fields; with narrow lanceolate leaves, corymbose rich blue flowers, and pointed sepals. ①

L. perénne, PERENNIAL FLAX. Cult. from Eu. in some varieties, for ornament, wild beyond the Mississippi; less tall than the foregoing, narrower-leaved; sepals blunt; petals sky-blue, sometimes pale, at least towards the base. ♃

L. grandiflòrum, LARGE-FL. RED FLAX. Cult as an annual, from North Africa; 1° high, with linear or lanceolate leaves, and showy crimson-red flowers. ① ♃

* * * *Cultivated in conservatories, shrubby, with* 3 *styles and large flowers.*

L. trígynum, of India, has rather large elliptical leaves, and a succession of large and showy bright-yellow flowers.

27. GERANIACEÆ, GERANIUM FAMILY.

As now received a large and multifarious order, not to be characterized as a whole in any short and easy way, including as it does Geraniums, Nasturtiums, Wood-Sorrels, Balsams, &c., which have to be separately described.

§ 1. *Flowers regular and symmetrical: sepals persistent. Herbs.*

1. OXALIS. Sepals and petals 5, the former imbricated, the latter convolute in the bud. Stamens 10, monadelphous at base, the alternate ones shorter. Styles 5, separate on a 5-celled ovary, which becomes a membranaceous several-seeded pod. Juice sour and watery. Leaves commonly of three obcordate or two-lobed leaflets, which droop at nightfall. Flowers usually open only in sunshine.
2. LIMNANTHES. Sepals and petals 5, the former valvate, the latter convolute in the bud. Glands on the receptacle 5. Stamens 10, separate at the base. Style 1, five-lobed at the apex, rising from the centre of a deeply five-lobed ovary, which in fruit becomes 5 separate thickish and wrinkled akenes. Leaves pinnate; the leaflets cut or cleft.

3. FLŒRKEA. Sepals, small petals, stigmas, and lobes of the ovary 3; and stamens 6: otherwise like Limnanthes.
4. GERANIUM. Sepals and petals 5, the former imbricated, the latter commonly convolute in the bud. Glands on the receptacle 5, alternate with the petals. Stamens 10, monadelphous at the base, the alternate filaments shorter, but usually bearing anthers. Style 5-cleft. Ovary 5-celled, 5-lobed, the lobes separating when ripe into 5 two-ovuled but one-seeded carpels or little pods, which remain hanging by their long naked recurving styles as these split off, from below upwards, from a long central beak or axis. (Lessons, p. 112, fig. 358, 359.) Leaves with stipules. Herbage scented.
5 ERODIUM. Stamens with anthers only 5. Styles when they split off from the beak bearded inside, often twisting spirally: otherwise as Geranium.

§ 2. *Flowers somewhat irregular, Geranium-like. Shrubby or fleshy-stemmed.*

6. PELARGONIUM. Sepals and petals 5; the base of one sepal extends downward on one side the pedicel forming a narrow tube or adherent spur, and the two petals on that side of the flower differ from the rest more or less in size or shape. Stamens with anthers fewer than 10, commonly 7. Pistil, &c. as in Geranium. Herbage scented. Leaves with stipules.

§ 3. *Flowers very irregular, spurred, also unsymmetrical. Tender herbs.*

7. TROPÆOLUM. Sepals 5, united at the base, and in the upper side of the flower extended into a long descending spur. Petals 5, or sometimes fewer, usually with claws: the two upper more or less different from the others and inserted at the mouth of the spur. Stamens 8, unequal or dissimilar; filaments usually turned downwards and curving. Ovary of 3 lobes surrounding the base of a single style, in fruit becoming 3 thick and fleshy closed separate carpels, each containing a single large seed. Herbs, climbing by their long leafstalks; the watery juice with the pungent odor and taste of Cress. Leaves alternate: stipules none or minute. Peduncles axillary, one-flowered.
8. IMPATIENS. Sepals and petals similarly colored, the parts belonging to each not readily distinguished. There are 3 small outer pieces, plainly sepals, on one side of the flower; then, on the other side, a large hanging sac contracted at the bottom into a spur or little tail; within are two small unequally 2-lobed petals, one each side of the sac. Stamens 5, short, conniving or lightly cohering around and covering the 5-celled ovary, which in fruit becomes a several-seeded pod: this bursts elastically, flying in pieces at the touch, scattering the seeds, separating into 5 twisting valves and a thickish axis. Style none. Seeds rather large. Erect, branching, succulent-stemmed herbs, with simple leaves and no stipules.

1. ÓXALIS, WOOD-SORREL. (Name from Greek words meaning *sour-salt,* from the oxalates or "salt-of-sorrel" contained in the juice.)

* *Native species, flowering through the summer: leaflets broadly obcordate.*

O. stricta, YELLOW W. Extremely common in waste or cultivated soil and open woodlands; stems 3′ – 12′ high, leafy; slender peduncles bearing an umbel of 2 – 6 small yellow flowers, followed by slender pods. ① ♃

O. Acetosélla, TRUE W. Common in mossy woods N.; the leafstalks and 1-flowered scapes 2′ – 4′ high from a creeping scaly-toothed rootstock; flower rather large, white with delicate reddish veins. ♃

O. violàcea, VIOLET W. Common S., rarer N., in rocky or sandy soil; leafstalks and slender scape from a scaly bulb, the flowers several in an umbel, middle-sized, violet. ♃

* * *Cultivated in conservatories, from Cape of Good Hope.*

O. Bówiei, a stemless species, with a small bulb on a spindle-shaped root; leafstalks and few-flowered scapes 6′ – 10′ high; broad obcordate leaflets almost 2′ long; petals deep rose-color, 1′ long.

O. speciòsa is more hairy; leaflets obovate and scarcely notched, commonly crimson underneath, only 1′ long; scapes short, 1-flowered; petals 1½′ long, pink-red with a yellowish base.

O. flàva, from a strong bulb sends up to the surface a short scaly stem, bearing thick flattish leafstalks and short 1-flowered scapes; the leaflets 6 – 10 and linear; petals nearly 1′ long, yellow, often edged with reddish.

O. versícolor, the commoner and prettiest species, from small bulbs sends up slender stems, 2′ – 3′ high, bearing at summit leaves of 3 almost linear leaflets notched at the end, and slender 1-flowered peduncles; petals 1′ long, white or tinged with rose, with bright pink-red margins underneath, so that the blossom is red when rolled up in the bud or closed in shade, but white above when it opens in sunshine.

* * * *Cultivated from South America for the edible tubers.*

O. crenàta, the OCA of Peru, rather common in France, bears abundance of potato-like tubers as large as pullet's-eggs; stem leafy, 2° high; leaflets obcordate; peduncles several-flowered; petals yellow, rather large, crenate or several-notched at the end.

2. LIMNÁNTHES. (Name from Greek words for *marsh flower:* but in fact the plant flourishes in merely moist soil.) ①

L. Douglásii. Cult. for ornament from California; a low and spreading, mostly smooth, and slightly succulent garden annual, with leaves of 5 – 7 oblong or lanceolate and often 3 – 5-cleft leaflets, and rather neat flowers (in summer), solitary on slender axillary peduncles; the petals white with a yellow base, wedge-oblong, notched at the end, twice the length of the calyx, about ½′ long.

3. FLŒRKEA, FALSE MERMAID. (Named for *Flœrke,* a German botanist.) ①

F. proserpinacoìdes, in marshes and wet alluvial soil; a small and insignificant plant, with the 3 – 5 leaflets lanceolate and entire, or rarely 2 – 3-cleft; the axillary and peduncled flower inconspicuous (in spring and summer), the oblong petals shorter than the calyx and entire.

4. GERÀNIUM, CRANESBILL. (From old Greek name for the *Crane,* alluding probably to the long beak in fruit.) The following are wild species of the country: the so-called Geraniums of cultivation belong to Pelargonium. Sepals usually slender-pointed. Fl. spring and summer.

G. maculàtum, WILD or SPOTTED CRANESBILL. Common in woodlands and open grounds; stem erect from a stout root or rootstock, about 2° high, hairy, branching and terminating in long peduncles bearing a pair of flowers; leaves palmately parted into 5 – 7 wedge-shaped divisions cut and cleft at the end, sometimes whitish-blotched; petals wedge-obovate, light purple, ½′ long, bearded on the short claw. 2ℓ

G. Caroliniànum, CAROLINA C. In open and mostly barren soil; stems erect or soon diffusely branched from the base, only 6′ – 18′ high; leaves palmately parted into 5 much cleft and cut divisions; peduncles and pedicels short; flowers barely half as large as in the foregoing, the pale rose-colored petals notched at the end. ① ②

G. Robertiànum, HERB ROBERT. Common N. in shady rocky places; very strong-scented, loosely hairy, diffusely spreading; leaves finely cut, being divided into 3 twice-pinnatifid divisions; flowers small; petals pink or red purple. ②

5. ERÒDIUM, STORKSBILL. (From Greek name for a *Heron.*)

E. cicutàrium, COMMON S. Nat. from Eu., in sterile soil, but not common, except in Texas and California, where it greatly abounds; low, hairy and rather viscid; the leaves mostly from the root, pinnate, and the leaflets finely once or twice pinnatifid; peduncle bearing an umbel of several small pinkish flowers, in summer. ① ②

6. PELARGÒNIUM, the GERANIUM, so-called, of house and summer-garden culture. (Name from Greek word for the *Stork,* from the beak of the fruit, which is like that of Geranium.) All are perennials, and most of the common ones more or less shrubby, natives of the Cape of Good Hope; in cultivation so mixed up by crossing that students will hardly be able to make out the species. The following are the types or originals of the commonest Sorts.

§ 1. *Leaves peltate and fleshy, the 5 lobes entire: stems trailing.*

P. peltàtum, Ivy-leaved P. Generally smooth, the leaf fixed towards the middle, with or without a darkish zone; flowers pink or varying to white.

§ 2. *Leaves round and crenate, very obscurely many-lobed and with a deep narrow sinus: petals all of one color (scarlet, pink, or varying to white), the two upper a little narrower than the others: stems erect, shrubby and succulent. The two species greatly mixed.*

P. zonàle, Horse-shoe P. So called from the dark horse-shoe mark or zone, which however is not always present; smoothish; petals narrowish.

P. ínquinans, Staining or Scarlet P. In the unmixed state is soft-downy and clammy, the leaves without the zone; petals broadly obovate, originally intense scarlet.

§ 3. *Leaves rounded, moderately if at all lobed: branches scarcely succulent: petals never scarlet, the two upper more or less larger than the three lower.*

* *Leaves sweet-scented, velvety or soft-downy: flowers small: stems or branches herbaceous or half herbaceous, spreading or straggling.*

P. capitàtum, Rose-scented P. Softly hairy, with the rose-scented leaves moderately lobed, the lobes short and broad; peduncle bearing many sessile flowers in a head; petals rose-purple, barely ½′ long.

P. tomentòsum, Peppermint P. Densely soft-hairy; branches long and thickish; leaves rather large, round-heart-shaped and with 5 – 7 open lobes, velvety-hairy both sides; flowers on long pedicels in panicled umbels, insignificant; petals white, the 3 lower a little longer than the calyx.

P. odoratíssimum, Nutmeg-scented P. Branches slender and straggling, from a very short scaly stem or base; leaves rounded and crenate, soft-velvety, small; flowers on short pedicels, very small; petals white, scarcely exceeding the calyx.

* * *Leaves not sweet-scented: flowers large, pink, purple, white, &c., the two upper petals longer and broader than the three lower and streaked or spotted: shrubby and erect. (All much mixed.)*

P. cucullàtum, Cowled P. Soft-hairy, the rounded kidney-shaped leaves cupped, soft-downy.

P. cordàtum, Heart-leaved P. Like the last or less hairy, with flat ovate-heart-shaped leaves.

P. angulòsum, Maple-leaved P. Harsher-hairy; the leaves rigid, inclined to be lobed, truncate or even wedge-shaped at the base (scarcely ever heart-shaped), sharply toothed.

§ 4. *Leaves decidedly lobed or cut, in some species compound or decompound,*

* *Smooth and pale or glaucous, rounded, palmately 5 – 7-cleft.*

P. grandiflòrum, Great-flowered P. Shrubby; peduncles bearing about 3 large flowers, with white petals 1½′ long, the two upper larger and elegantly veined or variegated with pink or rose-color.

* * *Silky-hoary, pinnately veined and somewhat pinnatifid.*

P. trícolor, Three-colored P. Low, rather shrubby; the long-petioled small leaves lance-oblong; peduncles bearing 2 or 3 showy flowers; the three lower petals white, the two upper crimson, with a dark spot at their base, and rather smaller, ½′ long: not common.

* * * *Soft-hoary or velvety, palmately 3-parted, small: no obvious stipules.*

P. exstipulàtum, Penny-Royal P. Low, rather shrubby; leaves with the sweet scent of Penny-Royal or Bergamot, ½′ wide, the lobes wedge-shaped and cut-toothed; flowers small and insignificant, white.

* * * * *Hairy, roughish, or downy: leaves more or less pinnatifid or pinnately compound or the main lobes or divisions pinnatifid, balsamic or strong-scented: stipules present.*

P. quercifòlium, Oak-leaved P. Shrubby, hairy and glandular; leaves deeply sinuate-pinnatifid, with wavy-toothed blunt lobes (the lowest

ones largest, making a triangular-heart-shaped outline), often dark-colored along the middle, unpleasantly scented; petals purple or pink, the two upper (1′ long) much longest.

P. gravèolens, HEAVY-SCENTED P. Shrubby and hairy like the last; leaves palmately 5 – 7-lobed or parted and the oblong lobes sinuate-pinnatifid; petals shorter.

P. Rádula, ROUGH P. Shrubby, rough and hairy above with short bristles; the balsamic or mint-scented leaves palmately parted and the divisions pinnately parted or again cut into narrow linear lobes, with revolute margins; peduncles short, bearing few small flowers; petals rose-color striped or veined with pink or purple.

P. fúlgidum, BRILLIANT P. Shrubby and succulent-stemmed, downy; leaves mostly 3-parted, with the lateral divisions wedge-shaped and 3-lobed, the middle one oblong and cut-pinnatifid; calyx broad in the throat; petals obovate, scarlet, often with dark lines, ½′ long.

P. tríste, SAD or NIGHT-SCENTED P. Stem succulent and very short from a tuberous rootstock, or none; leaves pinnately decompound, hairy; petals dull brownish-yellow with darker spots, sweet-scented at night.

7. TROPÆOLUM, NASTURTIUM or INDIAN CRESS. (Name from a Greek word for *a trophy*, the foliage of the common sort likened to a group of shields.) Cult. from South America, chiefly Peru, for ornament, and the pickled fruits used as a substitute for capers, having a similar flavor and pungency: fl. all summer, showy.

T. màjus, COMMON N. Climbing high, also low and scarcely climbing; leaves roundish and about 6-angled, peltate towards the middle; petals much longer than calyx, varying from orange to scarlet and crimson, pointless, entire or a little jagged at the end, and the 3 lower and longer-clawed ones fringed at the base: also a full double variety. ①

T. mìnus, SMALLER N. Smaller; petals paler yellow and with a pointed tip. Now less common than the preceding, but mixed with it. ①

T. tuberòsum, TUBEROUS N. Less common; leaves with 5 rather deep lobes; petals entire, orange, scarcely longer than the heavy-spurred orange-red calyx; tubers edible. ♃

T. peregrìnum, CANARY-BIRD FLOWER. Climbing high; leaves deeply 5 – 7-lobed and cut; spur hooked or curved; petals light yellow, the 2 upper lobed, the 3 lower small and fringed. ①

8. IMPÀTIENS, TOUCH-ME-NOT, JEWEL-WEED, BALSAM. (Name from the sudden bursting of the pod when touched.) Ours are all tender and succulent-stemmed annuals: fl. all summer.

I. pállida, PALE T. Wet ground and moist shady places, commonest N., 1° – 4° high, branched; leaves alternate, oval; flowers panicled, pale yellow dotted with brownish-red (rarely spotless), the sac broader than long and tipped with a short incurved spur.

I. fúlva, SPOTTED T. Commoner S.; has smaller orange-colored flowers spotted with reddish-brown, sac longer than broad and tapering into an inflexed spur (spots and spur rarely wanting).

I. Balsámina, GARDEN BALSAM, from India. Low, with crowded lanceolate leaves, the lower opposite, a cluster of large and showy short-spurred flowers in their axils, on short stalks, of very various shades (from white to red and purple); the finer sorts full double.

28. RUTACEÆ, RUE FAMILY.

Known by the transparent dots or glands (resembling punctures) in the simple or compound leaves, containing a pungent or acrid bitter-aromatic volatile oil; and stamens only as many or twice as many (or in Orange and Lemon more numerous), inserted on the base of a receptacle (or a glandular disk surrounding it) which

sometimes elevates more or less the single compound pistil or the 2 – 5 more or less separate carpels. Leaves either opposite or alternate, in ours mostly alternate, without stipules. Flowers only in No. 2 irregular. Many species are medicinal.

§ 1. *Perennial, strong-scented, hardy (exotic) herbs: flowers perfect: stamens* 8 *or* 10: *ovary* 4 – 5-*lobed*, 4 – 5-*celled: seeds several.*

1. RUTA. Sepals and petals 4 or 5, short, the latter roundish and arching. Stamens twice as many as the petals. Style 1. Pod globular and many-seeded. Leaves decompound.
2. DICTAMNUS. Sepals and petals 5; the latter long and lanceolate, on short claws, the lower one declining, the others ascending. Stamens 10; the long filaments declining and curved, partly glandular. Styles 5, nearly separate. Ovary a little elevated, deeply 5-lobed, in fruit becoming 5 flattened rough-glandular 2 – 3-seeded pods, each splitting when ripe into 2 valves, which divide into an outer and an inner layer. Leaves pinnate.

§ 2. *Shrubs or trees, hardy, with polygamous, dicœcious, or sometimes perfect, small (greenish or whitish) flowers: stamens* 4 *or* 5, *as many as the petals: seeds single or in pairs.*

* *Indigenous: leaves pinnate or of* 3 *leaflets, deciduous.*

3. ZANTHOXYLUM. Flowers dicœcious. Pistils 2 – 5; their styles slightly cohering; the ovaries separate, ripening into rather fleshy at length dry and 2-valved little pods. Seed black, smooth and shining. Prickly trees or shrubs: leaves pinnate.
4. PTELEA. Flowers polygamous. Pistil a 2-celled ovary tipped with a short style, forming a 2-celled 2-seeded and rounded wing-fruit or samara, in shape like that of the Elm. Not prickly: leaflets 3.

* * *Exotic: leaves simple and entire, evergreen.*

5. SKIMMIA. Flowers polygamous or perfect. Ovary 2 – 5-celled, with a single ovule from the top of each cell, in fruit becoming a red berry or drupe.

§ 3. *Shrubs or trees, exotic, not hardy, with sweet-scented foliage and perfect flowers, having numerous* (20 – 60) *stamens.*

6. CITRUS. Petals 4 – 8, usually 5, thickish. Filaments irregularly united more or less. Ovary many-celled, encircled at the base by a conspicuous disk (see Lessons, p. 113, fig. 363), in fruit becoming a thick-rinded many-seeded large berry. Branches usually spiny. Leaves evergreen, apparently simple, but with a joint between the blade and the (commonly winged or margined) petiole, showing that the leaf is a compound one reduced to the end-leaflet.

1. RÙTA, RUE. (The ancient name.) Natives of the Old World. ♃

R. gravèolens, COMMON RUE. Cult. in country gardens; a bushy herb, woody or almost shrubby at the base, with bluish-green and strongly dotted oblong or obovate small leaflets, the terminal one broader and notched at the end, and corymbs of greenish-yellow flowers, produced all summer; the earliest blossom has the parts in fives, the rest in fours. Plant very acrid, sometimes even blistering the skin.

2. DICTÁMNUS, FRAXINELLA. (Ancient Greek name.) Native of Southern Europe. ♃

D. Fraxinélla. Cult. for ornament; herb with an almost woody base, viscid-glandular, and with a strong aromatic scent; the leaves likened to those of Ash on a smaller scale (whence the common name) of 9 – 13 ovate and serrate leaflets; the large flowers in a terminal raceme, in summer, in one variety pale purple with redder veins, another white.

3. ZANTHÓXYLUM, PRICKLY ASH. (Name composed of two Greek words, meaning *yellow wood.*) Bark, leaves, and little fleshy pods very pungent and aromatic.

Z. Americànum, NORTHERN P. or TOOTHACHE-TREE. Rocky woods and banks N.; a prickly shrub or small tree, with leaves downy when young, of 9 – 11 ovate or oblong leaflets; the greenish flowers in axillary clusters, in

spring, preceding the leaves, either the sepals or petals wanting; pistils 3 – 5 with slender styles; the little pods about the size and shape of pepper-corns, lemon-scented, raised from the receptacle on thickish stalks.

Z. Carolinianum, SOUTHERN P. Sandy coast S.; a small tree, the bark armed with warty and the leafstalks with very slender prickles, smooth, with 7 – 9 ovate or lance-ovate leaflets, and whitish flowers in a terminal cyme, in early summer, later than the leaves, with the petals and sepals both present, 3 or 2 short-styled pistils, and pods not stalked.

4. PTÈLEA, HOP-TREE. (The ancient Greek name for the Elm, from the resemblance in the winged fruit.)

P. trifoliàta, THREE-LEAVED H. Rocky woods from Penn. S. & W.; a tall shrub or small tree, with ovate pointed leaflets, and a terminal cyme of small greenish-white unpleasantly scented flowers, in early summer; the orbicular winged fruit bitter, used as a substitute for hops.

5. SKÍMMIA. (*Skimmi* is the name in Japan, from which country the common species was recently introduced into ornamental cultivation.)

S. Japónica, a low quite hardy shrub, smooth, with oblong and entire bright-green evergreen leaves crowded on the end of the branches, which in spring are terminated with close panicle or cluster of small and white sweet-scented flowers, of no beauty, but followed by bright red berries which last over winter.

6. CÍTRUS, CITRON, ORANGE, &c. (Ancient name for *Citron.*) Natives of India, &c., cultivated with us only for ornament. Flowers white, very sweet-scented, rather showy. The species or varieties are much confused or mixed.

C. vulgàris, BITTER ORANGE, with broadly winged petiole; fruit with a thin roughish rind and acrid bitter pulp.

C. Aurántium, SWEET ORANGE, with a very narrow wing or slight margin to the petiole; fruit globose, with a smooth and thin separable rind and a sweet pulp.

Var. **myrtifòlia,** MYRTLE-LEAVED or CHINESE ORANGE, dwarf, with small leaves ($1' - 1\frac{1}{2}'$ long) and small fruit, depressed or sunken at the apex.

C. Limònium, LEMON, with a narrow wing or margin to the petiole, oblong and acute toothed leaves, petals commonly purplish outside, and fruit ovoid-oblong, with adherent rind and a very acid pulp.

C. Limétta, LIME, with wingless petiole, roundish or oval serrate leaves, and globular fruit with a firm rind and sweetish pulp.

C. Médica, CITRON (named from the country, *Media*), with wingless petiole, oblong or oval acute leaves, petals purplish outside, and a large oblong sweet-scented fruit with a very thick roughish adherent rind, and slightly acid pulp.

29. SIMARUBACEÆ, QUASSIA FAMILY.

May be regarded as Rutaceæ without transparent dots in the leaves; here represented by a single tree, the

1. AILÁNTHUS, CHINESE SUMACH or TREE-OF-HEAVEN. (*Ailanto,* a native name.) Flowers polygamous, small, greenish, in terminal branched panicles, with 5 short sepals and 5 petals, 10 stamens in the sterile flowers and few or none in the fertile; the latter with 2 to 5 ovaries (their styles lateral, united or soon separate), which in fruit become linear-oblong thin and membranaceous veiny samaras or keys, like those of Ash on a smaller scale, but 1-seeded in the middle.

A. glandulòsus, the only species known here, from China, is a common shade-tree, tall, of rapid growth, with hard wood, very long pinnate leaves, and many obliquely lanceolate entire or sparingly sinuate leaflets; flowers in early summer, the staminate very ill-scented.

30. MELIACEÆ, MELIA FAMILY.

Trees, chiefly with pinnately compound dotless leaves, stamens twice as many as the petals and united up to or beyond the anthers into a tube, and a several-celled ovary with a single style; almost all tropical, — represented in Florida and farther south by SWIETÈNIA MAHOGANI, the MAHOGANY-TREE, and by an exotic shade-tree at the South, viz.

1. MÈLIA. (Old Greek name of the Ash, transferred to a widely different tree.) Calyx 5 – 6-parted. Petals 5 or 6, linear-spatulate. Filaments united into a cylindrical tube with a 10 – 12-cleft mouth, enclosing as many anthers. Fruit a globose berry-like drupe, with a bony 5-celled stone, and a single seed in each cell. Flowers in large compound panicles.

M. Azédarach, PRIDE-OF-INDIA or CHINA-TREE. A favorite shade-tree at the S., 30° – 40° high, with twice pinnate smooth leaves, ovate and pointed toothed leaflets, of a deep green color, and numerous fragrant lilac-colored flowers, in spring, succeeded by the yellowish fruit.

31. ANACARDIACEÆ, CASHEW FAMILY.

Trees or shrubs, with resinous or acid, sometimes poisonous, often colored or milky juice; alternate leaves without stipules; small flowers with sepals, petals, and stamens 5; and a 1-celled 1-ovuled ovary bearing 3 styles or stigmas, — represented by the genus

1. RHÚS, SUMACH. (Ancient name.) Flowers polygamous or diœcious, sometimes perfect, whitish or greenish, in terminal or axillary panicles. Stamens inserted under the edge or between the lobes of a flattened disk in the bottom of the calyx. Fruit a small dry or berry-like drupe, the solitary seed on a curved stalk rising from the bottom of the cell. (The astringent leaves of some species are used for dyeing and tanning, those of R. CORIARIA in S. Europe for morocco leather. The juice of some Japanese species yield their famous lacquer; the fruit of another a sort of wax.)

§ 1. *Cultivated from Europe, with simple entire leaves: not poisonous.*

R. Cótinus, SMOKE-TREE or VENETIAN SUMACH. Shrub 5° – 9° high, smooth, with obovate leaves on slender petioles, loose panicles of flowers in early summer, followed rarely by little half-heart-shaped fruits: usually most of the flowers are abortive, while their pedicels lengthen, branch, and bear long plumy hairs, making large and light, feathery or cloud-like bunches, either greenish or tinged with red, which are very ornamental. The same or one very like it is wild in Alabama.

§ 2. *Native species, with compound leaves of* 3 – 31 *leaflets.*

* *Poisonous to the touch for most people, the juice resinous: flowers in slender axillary panicles, in summer: fruit smooth, white or dun-color.*

R. Toxicodéndron, POISON IVY or POISON OAK. Common in low grounds, climbing by rootlets over rocks, &c., or ascending trees; leaflets 3, rhombic-ovate, often sinuate or cut-lobed, rather downy beneath. A vile pest.

R. venenàta, POISON SUMACH, P. ELDER, or P. DOGWOOD. In swampy ground; shrub 6° – 18° high, smooth, with pinnate leaves of 7 – 13 obovate entire leaflets, and very slender panicles. More virulent than the foregoing.

* * *Not poisonous: fruit red and beset with reddish hairs, very acid.*

+– *Leaves pinnate: flowers whitish, in large and very compact terminal panicles, in early summer, succeeded by a compact mass of crimson fruit.*

R. týphina, STAGHORN SUMACH. Shrub or tree, on hillsides, &c., 10° – 30° high, with resinous-milky juice, brownish-yellow wood, velvety-hairy

branches and stalks, and large leaves of 11 – 31 lance-oblong pointed and serrate leaflets. Worthy to be planted for ornament.

R. glàbra, SMOOTH S. Shrub 2° – 12° high, in rocky places, like the last, but smooth, the leaflets whitened beneath. — Var. LACINIATA, in Penn., has the leaflets cut into narrow irregular lobes : planted for ornament.

R. copallìna, DWARF S. Shrub 1° – 5° high, in rocky or sandy ground, spreading by subterranean shoots ; with downy stalks or branches, petioles winged or broadly margined between the 9 – 21 oblong or lance-ovate oblique leaflets, which are thickish and shining above ; juice resinous.

+– +– *Leaves of* 3 *cut-lobed leaflets : flowers light yellow, in spring before the leaves appear, diœcious, in small scaly-bracted and catkin-like spikes.*

R. aromática, FRAGRANT S. A straggling bush in rocky places, from Vermont W. & S., with the small rhombic-ovate leaflets pubescent when young, aromatic-scented.

32. VITACEÆ, VINE FAMILY.

Woody plants, climbing by tendrils, with watery and often acid juice, alternate leaves, deciduous stipules, and small greenish flowers in a cyme or thyrsus ; with a minutely 4 – 5-toothed or almost obsolete calyx ; petals valvate in the bud and very deciduous ; the stamens as many as the petals and opposite them ; a 2-celled ovary with a pair of ovules rising from the base of each cell, becoming a berry containing 1 – 4 bony seeds. Tendrils and flower-clusters opposite the leaves.

1. VITIS. Calyx very short, a fleshy disk connecting it with the base of the ovary and bearing the petals and stamens.
2. AMPELOPSIS Calyx minutely 5-toothed : no disk. Petals expanding before they fall. Leaflets 5.

1. VÌTIS, GRAPE-VINE. (The classical Latin name.) Fl. in late spring.

§ 1. TRUE GRAPES. *Petals and stamens* 5, *the former lightly cohering at the top and thrown off without expanding : the base of the very short and truncate calyx filled with the disk, which rises into* 5 *thick lobes or glands between the stamens : leaves simple, rounded and heart-shaped, usually* 3 – 5*-lobed.*

* *Flowers all perfect, somewhat fragrant : exotic.*

V. vinífera, EUROPEAN GRAPE. Cult. from immemorial time, from the East, furnishing the principal grapes of our greenhouses, &c. ; some varieties nearly hardy N. : leaves green, cottony only when very young.

* * *Flowers more or less polygamous* (*some plants inclined to produce only staminate flowers*), *exhaling a fragrance like that of Mignonette : native species.*

+– *Bark of stem early separating in loose strips : panicles compound and loose.*

V. Labrúsca, NORTHERN FOX-GRAPE, the original of the CATAWBA, ISABELLA, and furnishing most of the American table and wine grapes ; common in moist grounds N. & W. : leaves and young shoots very cottony, even the adult leaves retaining the cottony wool underneath, the lobes separated by roundish sinuses ; fruit large, with a tough musky pulp when wild, dark purple or amber-color, in compact clusters.

V. æstivàlis, SUMMER GRAPE. Common N. & S. ; leaves green above, and with loose cobwebby down underneath, the lobes with roundish open sinuses ; clusters slender ; fruit smaller and earlier than in the foregoing, black with a bloom, pleasant. Original of the CLINTON GRAPE, &c.

V. cordifòlia, WINTER or FROST GRAPE. Common on banks of streams : leaves never cottony, green both sides, thin, heart-shaped, little lobed, but coarsely and sharply toothed ; clusters loose ; fruit small, bluish or black with a bloom, very sour, ripe after frosts. Var. RIPÀRIA, the common form along river-banks W. has broader and more cut or lobed leaves.

+ + *Bark of stem close and smooth, pale.*

V. vulpina, MUSCADINE, BULLACE, or FOX-GRAPE of the South. River-banks from Maryland and Kentucky S.: leaves rather small, round in outline, seldom and slightly lobed, glossy and mostly smooth both sides, the margin cut into coarse and broad teeth; clusters small; fruit large, $\frac{1}{2}' - \frac{3}{4}'$ in diameter, purple, thick-skinned, musky, or pleasant-flavored, ripe in early autumn: the original of the SCUPPERNONG GRAPE, &c.

§ 2. CISSUS. *Petals and stamens 4 or 5, the former opening regularly: disk thick and broad, 4 – 5-lobed: flowers mostly perfect: berries not larger than peas, not eatable.*

* *Wild species S. & W., smooth, usually with 5 stamens and petals.*

V. indivisa, a species with simple leaves like those of a true Grape, heart-shaped or ovate, pointed, coarsely-toothed, but not lobed; flower-clusters small and loose; style slender.

V. bipinnata, a bushy or low-climbing plant, with few tendrils, and decompound leaves, the small leaflets cut-toothed.

* * *Exotic species, with mostly 4 stamens and petals.*

V. heterophylla, from Japan, a form with the leaves blotched or variegated with white (small, thin, variously 3 – 5-lobed), and small blue berries, is hardy in gardens; cult. for the variegated foliage.

V. discolor, from Java, cult. in hothouses, for its splendid foliage; leaves lance-oblong with a heart-shaped base, crimson underneath, velvety-lustrous and dark-green shaded with purple or violet, or often mottled with white, on the upper surface, the shoots reddish.

2. AMPELÓPSIS, VIRGINIA-CREEPER. (Name from Greek words, meaning *like the Vine:* indeed, it is hardly distinct enough from the second section of *Vitis.*)

A. quinquefolia, the only genuine species: in all low grounds, climbing extensively, sometimes by rootlets as well as by the tendrils, the latter specially fitted for ascending walls and trunks, to which they attach themselves firmly by sucker-like disks at the tip of their branches (Lessons, p. 41, figs. 93, 94); leaflets 5, digitate, lance-oblong, cut-toothed, changing to crimson in autumn; flowers cymose, in summer; berries small, black or bluish.

33. RHAMNACEÆ, BUCKTHORN FAMILY.

Shrubs or trees, of bitterish and astringent properties, with simple chiefly alternate leaves and small flowers; well marked by the stamens of the number of the valvate sepals (4 or 5) and alternate with them, i. e. opposite the petals, inserted on a disk which lines the calyx-tube and often unites it with the base of the ovary, this having a single erect ovule in each of the (2 – 5) cells. Branches often thorny: stipules minute or none: flowers often apetalous or polygamous. Petals commonly hooded or involute around the stamen before it. (Lessons, p. 114, fig. 364, 365.)

* *Calyx free from the ovary.*

1. BERCHEMIA. Twining climbers, with straight-veined leaves. Petals 5, without claws, rather longer than the stamens. Disk thick, nearly filling the bottom of the calyx. Ovary 2-celled, becoming a 2-celled small stone-fruit, with purple and thin pulp.
2. RHAMNUS. Erect shrubs or trees, with loosely-veined leaves. Petals 4 or 5, with short claws. Stamens short. Ovary 2 – 4-celled, becoming a black berry-like fruit, containing 2 – 4 cartilaginous seed-like nutlets, which are grooved on the back, as is the contained seed. Cotyledons foliaceous.
3. FRANGULA. Like Rhamnus, but with straight-veined leaves; the nutlets not grooved but convex on the back: cotyledons thick.

* * *Calyx with the disk coherent with the base of the ovary and fruit.*

4. CEANOTHUS. Erect or depressed shrubs or undershrubs. Petals 5, hood-shaped, spreading, their claws and the filaments slender. Ovary 3-celled, when ripe becoming a cartilaginous or crustaceous 3-seeded pod.

1. BERCHÈMIA, SUPPLE-JACK. (Probably named for some botanist of the name of *Berchem.*)

B. volùbilis. Common in low grounds S., climbing high trees, smooth, with very tough and lithe stems (whence the popular name), small, oblong-ovate and simply parallel-veined leaves, and greenish-white flowers in small panicles terminating the branchlets, in early summer.

2. RHÁMNUS, BUCKTHORN. (The ancient name.) Flowers greenish, axillary, mostly in small clusters, commonly polygamous or diœcious, in early summer. Berry-like fruit mawkish.

* *Flowers with petals, the parts in fours: leaves minutely serrate.*

R. cathárticus, COMMON BUCKTHORN. Cult. from Eu., for hedges, run wild in a few places; forms a small tree, with thorny branchlets, ovate or oblong leaves, and 3–4-seeded fruit.

R. lanceolàtus, NARROW-LEAVED B. Wild from Penn. S. & W.; shrub not thorny, with lanceolate or oblong leaves, and 2-seeded fruit.

* * *Flowers without petals: stamens and lobes of the calyx* 5.

R. alnifòlius, ALDER-LEAVED B. Wild in cold swamps N.; a low shrub, with oval acute serrate leaves, and 3-seeded berry-like fruit.

3. FRÁNGULA, ALDER-BUCKTHORN. (From *frango*, to break, the stems brittle.) Flowers greenish, generally perfect, and the parts in fives.

F. Caroliniàna. Wild in wet grounds, from New Jersey and Kentucky S.; a thornless shrub or low tree, with oblong and almost entire rather large leaves; flowers solitary or in small clusters in the axils, in early summer; the 3-seeded fruit black.

4. CEANÒTHUS. (An ancient name, of unknown meaning, applied to these N. American plants.) Flowers in little umbels or fascicles, usually clustered in dense bunches or panicles, handsome, the calyx and even the pedicels colored like the petals and stamens. Ours are low undershrubby plants, with white flowers. In and beyond the Rocky Mountains, especially in California, are many species, some of them tall shrubs or small trees, loaded with showy blossoms.

C. Americànus, NEW-JERSEY TEA or RED-ROOT. Wild in dry grounds, 1°–2° high from a dark red root; leaves ovate or oblong ovate, finely serrate, downy beneath, 3-ribbed and veiny, deciduous (used as a substitute for tea in early times, the use lately revived); flowers crowded in a dense slender-peduncled cluster, in summer.

C. ovàlis. Wild on rocks N. from Vermont to Wisconsin: lower than the preceding and smoother, with smaller narrow-oval or lance-oblong leaves, and larger flowers on a shorter peduncle, in spring.

C. microphýllus, SMALL-LEAVED C. Dry barrens S.: low and spreading, much branched; leaves evergreen, very small, obovate, 3-ribbed; flower-clusters small and simple, in spring.

34. CELASTRACEÆ, STAFF-TREE FAMILY.

Shrubs, sometimes twining, with simple leaves, minute and deciduous stipules or none, and small flowers with sepals and petals both imbricated in the bud, and stamens of the number of the latter, alternate with them, and inserted on a disk which fills the bottom of the calyx and often covers the 2–5-celled few-ovuled ovary; the seeds usually furnished with or enclosed in a fleshy or pulpy aril.

Represented both as to native and cultivated plants by two genera:

1. CELASTRUS. Flowers polygamous or dicœcious. Petals and stamens 5, on the edge of a concave disk which lines the bottom of the calyx. Filaments and style rather slender. Pod globular, berry-like, but dry. Leaves alternate.
2. EUÓNYMUS. Flowers perfect, flat; the calyx-lobes and petals (4 or 5) widely spreading. Stamens mostly with short filaments or almost sessile anthers, borne on the surface of a flat disk which more or less conceals or covers the ovary. Pod 3 – 5-lobed, generally bright-colored. Leaves opposite: branchlets 4-sided.

1. CELÁSTRUS, STAFF-TREE. (Old Greek name, of obscure meaning and application.)

C. scándens, CLIMBING BITTER-SWEET or WAX-WORK. A twining high-climbing shrub, smooth, with thin ovate-oblong and pointed finely serrate leaves, racemes of greenish-white flowers (in early summer) terminating the branches, the petals serrate or crenate-toothed, and orange-colored berry-like pods in autumn, which open and display the seeds enclosed in their scarlet pulpy aril: wild in low grounds, and planted for the showy fruit.

2. EUÓNYMUS, SPINDLE-TREE. (Old Greek name, means *of good repute.*) Shrubs not twining, with dull-colored inconspicuous flowers, in small cymes on axillary peduncles, produced in early summer; the pods in autumn ornamental, especially when they open and display the seeds enveloped in their scarlet pulpy aril.

* *Leaves deciduous, finely serrate: style short or nearly none.*

+– *North American species: anthers sessile or nearly so.*

E. atropurpùreus, BURNING-BUSH or SPINDLE-TREE. Tall shrub, wild from New York W. & S., and commonly planted; with oval or oblong petioled leaves, flowers with rounded dark dull-purple petals (generally 4), and smooth deeply 4-lobed red fruit, hanging on slender peduncles.

E. Americànus, AMERICAN STRAWBERRY-BUSH. Low shrub, wild from New York W. & S., and sometimes cult.; with thickish ovate or lance-ovate almost sessile leaves, usually 5 greenish-purple rounded petals, and rough-warty somewhat 3-lobed fruit, crimson when ripe. Var. OBOVÀTUS, with thinner and dull obovate or oblong leaves, has long and spreading or trailing and rooting branches.

+– +– *Exotic: anthers raised on evident filaments.*

E. Europæus, EUROPEAN SPINDLE-TREE. Occasionally planted, but inferior to the foregoing; a rather low shrub, with lance-ovate or oblong short-petioled leaves, about 3-flowered peduncles, 4 greenish oblong petals, and a smooth 4-lobed red fruit, the aril orange-color.

* * *Leaves evergreen, serrulate: filaments and style rather slender.*

E. Japónicus, JAPAN S. Planted S. under the name of CHINESE BOX, there hardy, but is a greenhouse plant N.; has obovate shining and bright green leaves (also a form with white or yellowish variegation), several-flowered peduncles, 4 obovate whitish petals, and smooth globular pods.

35. SAPINDACEÆ, SOAPBERRY FAMILY.

Trees, shrubs, or one or two herbaceous climbers, mostly with compound or lobed leaves, and unsymmetrical flowers, the stamens sometimes twice as many as the petals or lobes of the calyx, but commonly rather fewer, when of equal number alternate with the petals; these imbricated in the bud, inserted on a disk in the bottom of the calyx and often coherent with it: ovary 2 – 3-celled, sometimes 2 – 3-lobed, with 1 – 3 (or in Staphylea several) ovules in each cell. The common plants belong to the three following suborders.

I. BLADDER-NUT FAMILY; has perfect and regular flowers, stamens as many as the petals, several bony seeds with a straight embryo in scanty albumen, and opposite compound leaves both stipulate and stipellate.

1. STAPHYLEA. Erect sepals, petals, and stamens 5; the latter borne on the margin of a fleshy disk which lines the bottom of the calyx. Styles 3, slender, separate or lightly cohering: ovary strongly 3-lobed, in fruit becoming a bladdery 3-lobed 3-celled and several-seeded large pod. Shrubs, with pinnately compound leaves of 3 or 5 leaflets.

II. SOAPBERRY FAMILY PROPER; has flowers often polygamous or diœcious, and more or less irregular or unsymmetrical, only 1 or 2 ovules, ripening but a single seed in each cell of the ovary, the embryo coiled or curved, without albumen. No stipules.

* *Leaves alternate. Pod bladdery-inflated, except in No.* 4.

2. CARDIOSPERMUM. Herbs, with twice ternate and cut-toothed leaves, climbing by hook-like tendrils in the flower-clusters. Sepals 4, the inner pair larger. Petals 4, each with an appendage on the inner face, that of the two upper large and petal-like, of the two lower crest-like and with a deflexed spur or process, raised on a claw. Disk irregular, enlarged into two glands, one before each lower petal. Stamens 8, turned towards the upper side of the flower away from the glands, the filaments next to them shorter. Styles or stigmas 3, short: ovary triangular, 3-celled, with a single ovule rising from the middle of each cell. Fruit a large and thin bladdery 3-lobed pod: seeds bony, globose, with a scale-like heart-shaped aril adherent to the base.
3. KŒLREUTERIA. Small tree, with pinnate leaves. Sepals 5. Petals 3 or 4 (the place of the others vacant), each with a small 2-parted scale-like appendage attached to its claw. Disk enlarging into a lobe before each petal. Stamens 5 – 8, declined: filaments hairy. Style single, slender: ovary triangular, 3-celled, with a pair of ovules in each cell. Pod bladdery, 3-lobed, 3-celled.
4. SAPINDUS. Trees, with abruptly pinnate leaves. Sepals and petals each 5, or rarely 4; the latter commonly with a little scale or appendage adhering to the short claw. Stamens mostly 8, equal. Style single: ovary 3-lobed, 3-celled, with a single ovule in each cell. Fruit mostly a globular and fleshy 1-celled berry (the other cells abortive), filled with a large globular seed, its coat crustaceous: cotyledons thick and fleshy.

* * *Leaves opposite, of* 5 – 9 *digitate leaflets. Pod leathery, not inflated.*

5. ÆSCULUS. Trees or shrubs. Calyx 5-lobed or 5-toothed. Petals 4 or 5, more or less unequal, on claws enclosed in the calyx, not appendaged. Stamens 7, rarely 6 or 8: filaments slender, often unequal. Style single, as also the minute stigma: ovary 3-celled, with a pair of ovules in each cell. Fruit a leathery pod, splitting at maturity into 3 valves, ripening 1 – 3 very large, chestnut-like, hard-coated seeds: the kernel of these consists of the very thick cotyledons firmly joined together, and a small incurved radicle.

III. MAPLE FAMILY; has flowers generally polygamous or diœcious, and sometimes apetalous, a mostly 2-lobed and 2-celled ovary, with a pair of ovules in each cell, ripening a single seed in each cell of the winged fruit. Embryo with long and thin cotyledons, coiled or crumpled. (See Lessons, p. 15, fig. 11 – 13, &c.) Leaves opposite: no stipules.

6. ACER. Trees, or a few only shrubs, with palmately-lobed or even parted leaves. Calyx mostly 5-cleft. Petals as many or none, and stamens 3 – 8 or rarely more, borne on the edge of the disk. Styles or stigmas 2, slender. Fruit a pair of samaras or key-fruits, united at the base or inner face and winged from the back. Occasionally the ovary is 3-celled and the fruit 3-winged.
7. NEGUNDO. Trees, with pinnate leaves of 3 – 7 leaflets, and diœcious very small flowers, without petals or disk; the calyx minute: stamens 4 or

Fruit, &c. of Acer.

1. STAPHYLÈA, BLADDER-NUT. (Name from a Greek word for a bunch of grapes, little applicable.)

S. trifòlia, American B. Shrub 8° – 10° high, with greenish striped branches, 3 ovate pointed serrate leaflets, deciduous stipules, and hanging raceme-like clusters of white flowers at the end of the branchlets of the season, in spring, followed by the large bladdery pods. Low ground, common N. & W.

S. pinnàta, European B., occasionally planted, is very similar, but has five leaflets.

2. CARDIOSPÉRMUM, BALLOON-VINE, HEART-SEED. (The latter is a translation of the Greek name.)

C. Halicácabum, the common species, wild in the S. W. States, is cult. in gardens, for the curious inflated pods; it is a delicate herb, climbing over low plants or spreading on the ground, with small white flowers, in summer.

3. KŒLREUTÈRIA. (Named for *Kœlreuter*, a German botanist.)

K. paniculàta, a small tree from China, planted in ornamental grounds; has pinnate leaves of numerous thin and coarsely toothed or cut leaflets, and a terminal ample branched panicle of small yellow flowers, in summer, followed by the bladdery pods.

4. SAPÍNDUS, SOAPBERRY. (*Sapo Indus*, i. e. Indian soap, the berries used as a substitute for soap.)

S. marginàtus, wild S. & W.: a small tree, with 8 – 20 broadly lanceolate falcate leaflets on a wingless but often margined common stalk, and small white flowers in panicles, in summer, the whitish berries as large as bullets.

5. ÆSCULUS, HORSE-CHESTNUT, BUCKEYE. (Ancient name of an Oak or other mast-bearing tree, applied to these trees on account of their large chestnut-like seeds. These, although loaded with farinaceous nourishment, are usually rendered uneatable, and even poisonous, by a bitter narcotic principle.) Flowers in a terminal crowded panicle, in late spring or early summer.

§ 1. True Horse-Chestnuts: *natives of Asia, with broad and spreading petals on short claws, and fruit more or less beset with prickly points.*

Æ. Hippocástanum, Common H. Tall fine tree, with 7 leaflets, and large flowers of 5 petals, white, and spotted with some purple and yellowish; stamens 7, declined: of late there is a double-flowered variety.

Æ. rubicúnda, Red H. Less tall, flowering even as a shrub, with brighter green leaves of 5 – 7 leaflets, flowers with 4 rose-red petals not so spreading, and mostly 8 stamens less declined. Probably a hybrid between Horse-Chestnut and some red Buckeye.

§ 2. *Californian, with 4 broad spreading petals on rather slender claws.*

Æ. Califórnica, Californian H. Low tree, of 5 slender-stalked leaflets, and a long very compact raceme-like panicle of small white or rosy-tinged flowers; stamens 5 – 7, slender; fruit large, with some rough points.

§ 3. Buckeyes: *of Atlantic U. S., with 4 erect and smaller petals on slender claws.*

Æ. parviflòra, Small Buckeye. Wild in the upper country S., and planted N.; shrub 3° – 9° high, with 5 – 7 leaflets soft downy underneath, slender raceme-like panicle 1° long, and capillary stamens very much longer than the narrow white petals; flowering N. as late as midsummer; fruit smooth; seeds small, almost eatable.

Æ. glàbra, Fetid or Ohio Buckeye. W. of the Alleghanies; tall tree, with 5 nearly smooth leaflets, a short panicle, stamens moderately longer than the somewhat uniform pale yellow petals, and fruit prickly roughened like that of Horse-Chestnut.

Æ. flàva, Yellow or Sweet Buckeye. W. & S.; tree or shrub, with 5 – 7 smooth or smoothish leaflets, a short dense panicle, oblong calyx, and

stamens not exceeding the connivent light yellow petals, these of two dissimilar pairs, the longer pair with very small blade; fruit smooth.

Var. **purpurascens,** Purplish B., has both calyx and corolla tinged with purple or reddish, and leaflets generally downy underneath.

Æ. Pavia, Red Buckeye. S. & W.; shrub or low tree, like the last, but leaves generally smooth; the longer and tubular calyx and the petals bright red: showy in cultivation.

6. ÀCER, MAPLE. (The classical Latin name.) Mostly fine trees.

* *Flowers in late spring or early summer, appearing more or less later than the leaves, in usually drooping racemes or corymbs, commonly terminating a* 2 – 4*-leaved shoot of the season, greenish or yellowish, with petals: stamens more than* 5, *generally* 8.

+– European Maples, *planted for ornament and shade.*

A. Pseudo-Platanus, Sycamore M. A fine tree, with spreading branches, ample 5-lobed leaves whitish and rather downy beneath, on long reddish petioles, the lobes toothed, long racemes, and moderately spreading wings to the pubescent fruit.

A. platanoides, Norway M., here so called. A handsome, round-headed tree, with thin and broad smooth leaves, bright green both sides, their 5 short lobes set with 2 – 5 coarse and taper-pointed teeth, a small corymb of flowers, and flat smooth fruit with wings 2′ long, diverging in a straight line. Juice milky · leaves holding green later than the others.

+– +– Oregon and Californian Maples, *beginning to be planted East.*

A. circinàtum, Round-leaved or Vine M. Tall, spreading shrub with thin and rounded moderately 7 – 9-lobed leaves, their lobes serrate, small corymbs of purplish flowers, and wings of fruit diverging in a straight line.

A. macrophýllum, Large-leaved M. Small timber-tree, with thickish leaves 6′ – 12′ across and deeply 5 – 7-lobed, the lobes with one or two sinuate lobes or coarse teeth, many yellowish flowers in a compact raceme, and hairy fruit with ascending wings.

+– +– +– Native Striped and Mountain Maples.

A. spicàtum, Mountain M. Tall shrub, common N., with slightly 3-lobed and coarsely toothed leaves downy beneath, and upright dense racemes of small flowers, followed by small fruits with diverging narrow wings. The latest-flowering species.

A. Pennsylvánicum, Striped M., also called Moose-wood and Striped Dogwood. Small tree, common N., with light-green bark striped with darker lines, large thin leaves finely sharply serrate all round, and at the end with 3 short and very taper-pointed lobes, slender hanging racemes of rather large green flowers, and fruit with diverging wings.

* * Sugar Maples. *Flowers appearing with the leaves in spring, in umbel-like clusters, on long drooping pedicels, greenish-yellow, without petals: stamens* 7 *or* 8.

A. saccharinum, Rock or Sugar M. Large tree, common especially N., valuable for timber and for the sugar of its sap; with rather deeply 3 – 5-lobed leaves pale or whitish beneath, the sinuses open and rounded, and the lobes with one or two sinuate coarse teeth; calyx bell-shaped and hairy-fringed; wings of fruit ascending, barely 1′ long.

Var. **nigrum,** Black Sugar M., a form with leaves green or greener and more or less downy beneath, even when old, the sinus at the base apt to be deep and narrow.

* * * Soft Maples. *Flowers in earliest spring, much preceding the leaves, in umbel-like clusters from separate lateral buds: pedicels at first short, the fruiting ones lengthening and drooping: stamens* 3 – 6: *fruit ripe and falling in early summer.*

A. dasycarpum, White or Silver M. A handsome tree in low grounds, with long and spreading or drooping branches, soft white wood, very

deeply 5-lobed leaves silvery-white and when young downy beneath, the narrow lobes coarsely cut and toothed; flowers greenish, in earliest spring, without petals; fruit woolly when young, but soon smooth, 2′ – 3′ long including the great diverging wings.

A. rùbrum, Red or Swamp M. Rather small tree, in wet grounds, with soft white wood, reddish twigs, moderately 3 – 5-lobed leaves whitish beneath, the middle lobe longest, all irregularly serrate; flowers scarlet, crimson, or sometimes yellowish (later than in the foregoing species); fruit smooth, with the slightly spreading wings 1′ or less in length, often reddish.

7. NEGÚNDO, ASH-LEAVED MAPLE, BOX-ELDER. (Obscure or unmeaning name.)

N. aceroides. A handsome, rather small tree, common from Penn. S. & W., with light green twigs, and drooping clusters of small greenish flowers, in spring, rather earlier than the leaves, the fertile ones in drooping racemes, the oblong fruits half the length of the very veiny wing; leaflets ovate, pointed, coarsely toothed, very veiny. A variety with white-variegated leaves is lately cult. for ornament.

36. POLYGALACEÆ, POLYGALA FAMILY.

Bitter, some of them medicinal plants, represented mainly, and here wholly, by the genus

1. POLÝGALA, MILKWORT. (Name from Greek words, meaning *much milk;* but the plants have no milky juice at all; they are thought to have been so named from a notion that in pasturage they increased the milk of cows.) Flowers remarkably irregular, in outward appearance as if papilionaceous like those of the next family, but really of a quite different structure. Calyx persistent, of 5 sepals; three of them small, viz. two on the lower, and one on the upper, side of the blossom; and one on each side called *wings* which are larger, colored, and would be taken for petals. Within these, on the lower side, are three petals united into one body, the middle one keel-shaped and often bearing a crest or appendage. Stamens 8 or sometimes 6; their filaments united below into a split sheath, separating above usually in two equal sets, concealed in the hooded middle petal: anthers 1-celled, opening by a hole at the top. Style curved and commonly enlarged above or variously irregular. Ovary 2-celled, with a single ovule hanging from the top of each cell, becoming a small flattish 2-seeded pod. Seed with an appendage at the attachment (*caruncle*): embryo straight, with flat cotyledons in a little albumen. Leaves simple, entire, without stipules. Our native species are numerous, mostly with small or even minute flowers, and are rather difficult to study. The following are the commonest.

§ 1. *Native species, low herbs, mostly smooth.*

* *Flowers yellow, some turning green in drying, in dense spikes or heads: leaves alternate. Growing in low or wet places in pine-barrens, S. E. Fl. summer.*

+– *Numerous short spikes or heads in a corymb.*

P. cymòsa. Stem 1° – 3° high, branching at top into a compound corymb of spikes; leaves linear, acute, the uppermost small; no caruncle to the seed. From North Carolina S.

P. ramòsa. Stem 6′ – 12′ high, more branched; lowest leaves obovate or spatulate, upper ones lanceolate; a caruncle at base of seed. Delaware and S.

+– +– *Short and thick spike or head single: root-leaves clustered.*

P. lùtea, Yellow Bachelor's-Button of S. Stem 5′ – 12′ high; lower leaves spatulate or obovate, upper lanceolate; flowers bright orange.

P. nàna. Stems 2′ – 4′ high, in a cluster from the spatulate or linear root-leaves; flowers lighter yellow.

* * *Flowers purple or rose-color, in a single dense spike terminating the stem or branches: no subterranean flowers. Fl. all summer.* ①

+ *Leaves all alternate, narrow.*

P. incarnàta. From Penn. W. & S.; stem slender, 6′ – 12′ high; leaves minute and awl-shaped; the three united petals extended below into a long and slender tube, the crest of the middle one conspicuous.

P. sanguínea. Sandy damp ground: stem 4′ – 8′ high, leafy to the top; leaves oblong-linear; flowers bright rose-purple (sometimes pale or even white), in a thick globular at length oblong head or spike, without pedicels.

P. fastigiàta. Pine-barrens from New Jersey S.; slender, 4′ – 10′ high, with smaller narrow-linear leaves, and oblong dense spike of smaller rose-purple flowers, on pedicels as long as the pod; bracts falling off.

P. Nuttállii. Sandy soil, from coast of Mass. S.; lower than the foregoing; flowers rather looser in more cylindrical spikes, greenish-purple; awl-shaped bracts remaining on the axis after the flowers or fruits have fallen.

+ + *Leaves all or all the lower ones in whorls of four.*

P. cruciàta. Low grounds: stems 3′ – 10′ high, 4-angled, and with spreading branches; leaves linear or spatulate, mostly in fours; spike thick and short, nearly sessile, its axis rough with persistent bracts where the flowers have fallen; wings of the flower broad-ovate or heart-shaped, bristly-pointed.

P. brevifòlia. Sandy bogs from Rhode Island S.: differs from the last only in more slender stems, narrower leaves, those on the branches alternate, the spike stalked, and wings of the flower lance-ovate and nearly pointless.

* * * *Flowers (all summer) greenish-white or scarcely tinged with purple, very small, in slender spikes, none subterranean: leaves linear, the lower in whorls of four or five.* ①

P. verticillàta. Very common in dry sterile soil; stem 5′ – 10′ high, much branched; all the leaves of the main stem whorled.

P. ambígua. In similar places and very like the last, chiefly S. & W., more slender; only the lowest leaves whorled; flowers more scattered and often purplish-tinged, in long-peduncled spikes.

* * * * *Flowers white, small (in late spring) in a close spike terminating simple tufted stems which rise from a perennial root, none subterranean: leaves numerous, all alternate.* ♃

P. Sénega, Seneca Snakeroot. A medicinal plant, commoner W., 5′ – 12′ high, with lanceolate or oblong, or even lance-ovate short leaves, cylindrical spike, round-obovate wings, and small crest.

P. álba. Common only far W. & S. W.; more slender than the last, with narrow-linear leaves, more tapering long-peduncled spike, and oval wings.

* * * * * *Flowers rose-purple in a raceme, or single, largish: leaves alternate.*

P. grandiflòra. Dry soil S.; pubescent, with branching stems 1° high, lanceolate leaves, crestless flowers scattered in a loose raceme (in late summer), bright purple turning greenish. ♃

P. polýgama. Sandy barrens, with tufted and very leafy stems 5′ – 8′ high, linear-oblong or oblanceolate leaves, and many-flowered racemes of handsome rose-purple flowers, their crest conspicuous; also on short underground runners are some whitish very fertile flowers with no evident corolla. Fl. all summer. ②

P. paucifòlia, Fringed Polygala, sometimes called Flowering Wintergreen. Light soil in woods, chiefly N.: a delicate little plant, with stems 3′ – 4′ high, rising from long and slender runners or subterranean shoots, on which are concealed inconspicuous fertile flowers; leaves few and crowded at the summit, ovate, petioled, some of them with a slender-peduncled showy flower from the axil, of delicate rose-red color (rarely a white variety), almost an inch long, with a conspicuous fringed crest and only 6 stamens; in spring. ♃

§ 2. *Shrubby species of the conservatory, from the Cape of Good Hope.*

P. oppositifòlia, with opposite sessile heart-shaped and mucronate leaves, of a pale hue, and large and showy purple flowers, with a tufted crest.

P. myrtifòlia, has crowded alternate oblong or obovate leaves, on short petioles, and showy purple flowers 1′ long, with a tufted crest.

37. LEGUMINOSÆ, PULSE FAMILY.

Distinguished by the *papilionaceous* corolla (Lessons, p. 91, fig. 261, 262), usually accompanied by 10 monadelphous or diadelphous or rarely distinct stamens (Lessons, p. 100, fig. 287, 288), and the *legume* (Lessons, p. 122, fig. 393, 394). These characters are combined in the proper Pulse Family. In the two other great divisions the corolla becomes less papilionaceous or wholly regular. Alternate leaves, chiefly compound, entire leaflets, and stipules are almost universal in this great order.

I. PULSE FAMILY PROPER. Flower (always on the plan of 5, and stamens not exceeding 10) truly papilionaceous, i. e. the standard outside of and in the bud enwrapping the other petals, or only the standard present in Amorpha. (For the terms used to denote the parts of this sort of corolla see Lessons, p. 91.) Sepals united more or less into a tube or cup. Leaves never twice compound.

A. *Stamens monadelphous or diadelphous.*

§ 1. *Herbs, shrubs, or one a small tree, never twining, trailing, nor tendril-bearing, with leaves simple or of* 3 *or more digitate leaflets, monadelphous stamens, and the alternate five anthers differing in size and shape from the other five: pod usually several-seeded.*

1. LUPINUS. Leaves of several leaflets, in one species simple: stipules adherent to the base of the petiole. Flowers in a long thick raceme. Calyx deeply 2-lipped. Corolla of peculiar shape, the sides of the rounded standard being rolled backwards, and the wings lightly cohering over and enclosing the narrow and incurved scythe-shaped or sickle-shaped keel. Pod flat. Mostly herbs.
2. CROTALARIA. Leaves in our species simple, and with foliaceous stipules free from the petiole but running down on the stem. Calyx 5-lobed. Keel scythe-shaped, pointed. Stamens with the tube of filaments split down on the upper side. Pod inflated. Ours herbs.
3. GENISTA. Leaves simple and entire: stipules very minute or none. Calyx 5-cleft. Keel oblong, nearly straight, blunt, turned down when the flower opens. Pod mostly flat. Low shrubby plants.
4. CYTISUS. Leaves of one or three leaflets, or the green branches sometimes leafless: stipules minute or wanting. Calyx 2-lipped or 5-toothed. Keel straight or somewhat curved, blunt, soon turned down. Style incurved or even coiled up after the flower opens. Pod flat. Seeds with a fleshy or scale-like appendage (*strophiole*) at the scar. Low shrubby plants.
5. LABURNUM. Leaves of three leaflets: stipules inconspicuous or wanting. Calyx with 2 short lips, the upper lip notched. Keel incurved, not pointed. Ovary and flat pod somewhat stalked in the calyx. Seeds naked at the scar. Trees or shrubs, with golden yellow flowers in long hanging racemes.

§ 2. *Herbs, never twining nor tendril-bearing, with leaves of* 3 *leaflets (rarely more but then digitate), their margins commonly more or less toothed (which is remarkable in this family): stipules conspicuous and united with the base of the petiole* (Lessons, p. 66, fig. 177): *stamens diadelphous: pod* 1*–few-seeded, never divided across into joints.*

* *Leaves pinnately* 3*-foliolate, as is seen by the end leaflet being jointed with the common petiole above the side leaflets.*

6. TRIGONELLA. Herbage odorous. Flowers (in the common cult. species) single and nearly sessile in the axil of the leaves. Pod elongated, oblong or linear, tapering into a long-pointed apex.
7. MEDICAGO. Flowers small, in spikes, heads, &c. Corolla short, not united with the tube of stamens. Pod curved or coiled up, at least kidney-shaped.
8. MELILOTUS. Herbage sweet-scented. Flowers small, in slender racemes. Corolla as in Medicago. Pod small, but exceeding the calyx, globular, wrinkled, closed, 1–2-seeded.

* * *Leaves mostly digitate or palmately 3-foliolate, all (with one exception) borne directly on the apex of the common petiole.*

9. TRIFOLIUM. Flowers in heads, spikes, or head-like umbels. Calyx with slender or bristle-form teeth or lobes. Corolla slowly withering or becoming dry and permanent after flowering; the claws of all the petals (except sometimes the standard) more or less united below with the tube of stamens or also with each other. Pod small and thin single- few-seeded, generally included in the calyx or the persistent corolla.

§ 3. *Herbs or woody plants, sometimes twining, never tendril bearing, with the leaves not digitate, or even digitately 3-foliolate (except in* Psoralea), *and the leaflets not toothed. (For* Cicer *see the next section.) Stipules except in No.* 15, 20 and 27, *not united with the petiole.*

* *Flowers (small, in spikes or heads) indistinctly or imperfectly papilionaceous. Pod very small and usually remaining closed, only 1 – 2-seeded. Calyx 5-toothed, persistent. Leaves odd-pinnate, mostly dotted with dark spots or glands.*

+– *Petals 5, on very slender claws: stamens monadelphous in a split tube.*

10. PETALOSTEMON. Herbs, with crowded leaves. Four petals similar, spreading, borne on the top of the tube of the stamens; the fifth (answering to the standard) rising from the bottom of the calyx, and heart-shaped or oblong. Stamens only 5.

11. DALEA. Herbs, as to our species. Flowers as in the last, but rather more papilionaceous, four of the petals borne on the middle of the tube of 10 stamens.

+– +– *Petal only one! Stamens monadelphous only at the very base.*

12. AMORPHA. Shrubs, with leaves of many leaflets. Standard (the other petals wholly wanting) wrapped around the 10 filaments and style. Flowers violet or purple, in single or clustered terminal spikes.

* * *Flowers (large and showy, in racemes) incompletely papilionaceous from the wings or the keel also being small and inconspicuous. Pod several-seeded.*

30. ERYTHRINA. See p. 108.

* * * *Flowers obviously papilionaceous, all the parts conspicuously present. Stamens mostly diadelphous.*

+– *Ovary 1-ovuled, becoming a 1-seeded indehiscent akene-like fruit. Herbs.*

13. PSORALEA. Leaves of 3 or 5 leaflets, often glandular-dotted. Flowers (never yellow) in spikes or racemes, often 2 or 3 under each bract. Pod ovate, thick, included or partly so in the 5-cleft persistent calyx, often wrinkled.

14. ONOBRYCHIS. Leaves odd-pinnate, of numerous leaflets. Flowers racemed, rose-purple. Pod flattish, wrinkled and spiny-roughened or crested.

15. STYLOSANTHES. Leaves pinnately 3-foliolate. Flowers yellow, in heads or short spikes, leafy-bracted. Calyx with a slender stalk-like tube, and 4 lobes in the upper lip, one for the lower. Stamens monadelphous: 5 longer anthers fixed by their base, 5 alternate ones by their middle. Pod flat, reticulated, sometimes raised on a stalk-like empty lower joint. Stipules united with the petiole.

16. LESPEDEZA. Leaves pinnately 3-foliolate. Stipules small and free, or falling early. Flowers purple, rose-color, or white, in spikes, clusters, or panicles, or scattered. Stamens diadelphous: anthers uniform. Pod flat and thin, ovate or orbicular, reticulated, sometimes raised on a stalk-like empty lower joint.

+– +– *Ovary with at least 2 ovules.*

++ *Pod separating into 2 or more small and closed 1-seeded joints in a row.*

17. DESMODIUM. Leaflets 3 (rarely only 1), stipellate. Pod of very flat joints (Lessons, p. 122, fig. 394), usually roughish and adhesive by minute hooked pubescence. Herbs, with small purple, whitish, or purplish flowers, in racemes, which are often panicled.

18. ÆSCHYNOMENE. Leaflets several, odd-pinnate, small. Pod of very flat joints. Herbs, with small yellow flowers (sometimes purplish externally), few or several on axillary peduncles.

19. CORONILLA. Leaflets several, odd-pinnate, small. Pod of thickish oblong or linear joints. Herbs or shrubs, with flowers in head-like umbels raised on slender axillary peduncles.

++ ++ *Pod indehiscent, very thick,* 1–3*-seeded. Calyx with a long, thread-shaped or stalk-like tube. Leaves abruptly pinnate: stipules united with the petiole at base.*

20. ARACHIS. Annual. Leaflets 4, straight-veined. Flowers small, yellow, in axillary heads or spikes. Calyx with one narrow lobe making a lower lip, the upper lip broad and 4-toothed. Keel incurved and pointed. Stamens monadelphous, 5 anthers longer and fixed by near their base, the alternate ones short and fixed by their middle. Ovary at the bottom of the very long and stalk-like tube of the calyx, containing 2 or 3 ovules: when the long style and the calyx with the rest of the flower falls away, the forming pod is protruded on a rigid deflexed stalk which then appears, and is pushed into the soil where it ripens into the oblong, reticulated, thick, coriaceous fruit, which contains the 1–3 large and edible seeds; the embryo composed of a pair of very thick and fleshy cotyledons and an extremely short nearly straight radicle.

++ ++ ++ *Pod continuous, i. e. not in joints, at length opening,* 2 *– several-seeded.*

a. *Leaves abruptly pinnate: plants not twining.* (*Flowers in ours yellow.*)

21. SESBANIA. Herbs, with many pairs of leaflets, and minute or early deciduous stipules. Flowers in axillary racemes, or sometimes solitary. Calyx short, 5-toothed. Standard rounded, spreading: keel and style incurved. Pod usually intercepted internally with cellular matter or membrane between the seeds.

22. CARAGANA. Shrubs, with mostly fascicled leaves of several pairs of leaflets, and a little spiny tip in place of an end leaflet: stipules minute or spiny. Flowers solitary or 2–3 together on short peduncles. Calyx bell-shaped or short-tubular, 5-toothed. Standard nearly erect with the sides turned back: the blunt keel and the style nearly straight. Pod linear, several-seeded.

b. *Leaves odd-pinnate: stems not twining.*

1. *Anthers tipped with a little gland or blunt point.*

23. INDIGOFERA. Herbs, or sometimes shrubby, when pubescent the close-pressed hairs are fixed by the middle. Flowers rose-color, purple, or white, in axillary racemes or spikes, mostly small. Calyx 5-cleft. Standard roundish, often persistent after the rest of the petals have fallen: keel with a projection or spur on each side. Pod oblong, linear, or of various shapes, commonly with membranous partitions between the seeds.

2. *Anthers blunt and pointless.*

24. TEPHROSIA. Herbs, with obliquely parallel-veined leaflets often silky beneath, and white or purple flowers (2 or more in a cluster) in racemes; the peduncles terminal or opposite the leaves. Calyx 5-cleft or 5-toothed. Standard rounded, silky outside. Style incurved, rigid: stigma with a tuft of hairs. Pod linear, flat, several-seeded.

25. ROBINIA. Trees or shrubs, with netted-veined leaflets furnished with stipels, and often with sharp spines or prickles for stipules. Flowers large and showy, white or rose-color, in axillary racemes. Base of the leafstalk hollow and covering the axillary bud of the next year. Calyx 5-toothed, the two upper teeth partly united. Standard large, turned back: keel incurved, blunt. Ovary stalked in the calyx. Pod broadly linear, flat, several-seeded, margined on the seed-bearing edge, the valves thin.

26. COLUTEA. Shrubs, not prickly, and no stipels to the leaflets; the flowers rather large, yellow or reddish, in short axillary racemes. Calyx 5-toothed. Standard rounded, spreading: keel strongly incurved, blunt, on long united claws. Style incurved, bearded down one side. Pod raised out of the calyx on a stalk of its own, thin and bladdery-inflated, flattish on the seed-bearing side, several-seeded.

27. ASTRAGALUS. Herbs, without stipels, and with white, purple, or yellowish rather small flowers in spikes, heads, or racemes: peduncles axillary. Corolla narrow: standard erect, mostly oblong. Style and stigma smooth and beardless. Pod commonly turgid or inflated and within more or less divided lengthwise by intrusion of the back or a false partition from it.

(SWAINSONA, SUTHERLANDIA, and CLIANTHUS, plants from Australia, New Zealand, and South Africa, with showy flowers and bladdery-inflated pods (like Colutea), are sometimes cult. in conservatories, but are not common enough to find a place here.)

c. *Leaves odd-pinnate: stems twining: stipels obscure: stipules small.*

28. WISTARIA. Woody, high-climbing, with numerous leaflets, and large showy bluish flowers, in hanging terminal dense racemes. Calyx with 2 short teeth on the upper and longer ones on the lower side. Standard large, roundish, turned back: keel merely incurved, blunt. Pod knobby, several-seeded.

29. APIOS. Herbs, twining over bushes, with 5 – 7 leaflets, and sweet-scented chocolate-purple flowers, in dense and short racemes: peduncles axillary. Calyx with 2 upper very short teeth, and one longer lower one, the side teeth nearly wanting. Standard very broad, turned back: keel long and scythe-shaped, strongly incurved, or at length coiled. Pod linear, flat, almost straight, several-seeded.

d. *Leaves of* 3 *leaflets* (*pinnately* 3-*foliolate*) *or rarely one, commonly stipellate.*

1. *Shrubby, or from a woody base: wings and sometimes keel small and inconspicuous.*

30 ERYTHRINA. Stem, branches, and even the leafstalks usually prickly. Flowers large and showy, usually red, in racemes. Calyx without teeth. Standard elongated: wings often wanting or so small as to be concealed in the calyx; keel much shorter than the standard, sometimes very small. Pod stalked in the calyx, linear, knobby, usually opening only down the seed-bearing suture. Seeds scarlet.

2. *Herbs, mostly twiners, with wings and keel in ordinary proportion.*

= *Flowers not yellow: seeds or at least the ovules several: leaflets stipellate.*

31. PHASEOLUS. Keel of the corolla coiling into a ring or spiral, usually with a tapering blunt apex: standard rounded, turned back or spreading. Style coiled with the keel, bearded down the inner side: stigma oblique or lateral. Pod linear or scimetar-shaped. Flowers usually clustered on the knotty joints of the raceme. Stipules striate, persistent.

32. DOLICHOS. Keel of the corolla narrow and bent inwards at a right angle, but not coiling. Style bearded under the terminal stigma. Stipules small. Otherwise nearly as Phaseolus.

33. GALACTIA. Keel straightish, blunt, as long as the wings: standard turned back. Style naked. Calyx of 4 pointed lobes, upper one broadest. Pod flattened, mostly linear. Flowers clustered on the knotty joints of the raceme: flower-buds taper-pointed. Stipules and bracts small or deciduous.

34. AMPHICARPÆA. Keel and very similar wings nearly straight, blunt: the erect standard partly folded around them. Style naked. Calyx tubular, 4-toothed. Flowers small; those in loose racemes above often sterile, their pods when formed scimetar-shaped and few-seeded; those at or near the ground or on creeping branches very small and without manifest corolla, but very fertile, making small and fleshy, obovate or pear-shaped, mostly subterranean pods, ripening one or two large seeds. Bracts rounded and persistent, striate, as are the stipules.

35. CENTROSEMA. Keel broad, incurved, nearly equalling the wings: standard large and rounded, spreading, and with a spur-like projection behind. Calyx short, 5-cleft. Style bearded only at the tip around the stigma. Pod long, linear, with thickened edges bordered by a raised line on each side. Flowers showy. Stipules, bracts, and bractlets striate, persistent.

36. CLITORIA. Keel small, shorter than the wings, incurved, acute: standard much larger than the rest of the flower, notched at the end, erect. Calyx tubular, 5-toothed. Style bearded down the inner side. Pod oblong-linear, flattish, not bordered. Flowers large and showy, 1 – 3 on a peduncle. Stipules, bracts, and bractlets persistent, striate.

37. HARDENBERGIA. Keel small, much shorter than the wings, incurved, blunt: standard large in proportion, rounded, spreading. Calyx short, 5-toothed, the 2 upper teeth united. Style short, naked. Pod linear, not bordered. Flowers rather small, in racemes. Stipules and bracts small, striate, mostly deciduous. Leaflets mostly single.

38. KENNEDYA. Keel incurved, blunt or acute, mostly equalling or exceeding the wings: standard broad, spreading. Calyx 5-lobed: 2 upper lobes partly united. Style naked. Pod linear, not bordered. Flowers showy, red, single or few on the peduncle. Bracts and stipules striate.

= = *Flowers yellow* (*sometimes purple-tinged outside*): *ovules only* 2: *pod* 1 – 2-*seeded.*

39. RHYNCHOSIA. Keel of the corolla incurved at the apex: standard spreading. Calyx 4 – 5-parted or lobed. Pod short and flat. Flowers small. Leaves mostly soft-downy and resinous-dotted, sometimes of a single leaflet.

§ 4. *Herbs, with abruptly pinnate leaves, the common petiole terminated by a tendril, by which the plant climbs or supports itself, or in many low species the tendril reduced to a mere bristle or tip. or in* Cicer, *which has toothed leaflets, an odd leaflet commonly takes its place: peduncles axillary: stamens almost always diadelphous. Cotyledons very thick, so that they remain underground in germination, as in the Pea.*

* *Leaflets entire or sometimes toothed at the apex: radicle bent on the cotyledons: style inflexed: pod flat or flattish.*

40. PISUM. Lobes of the calyx leafy. Style rigid, dilated above and the margins reflexed and joined together so that it becomes flattened laterally, bearded down the inner edge. Pod several-seeded: seeds globose. Flowers large. Leaflets only 1 – 3 pairs.
41. LATHYRUS. Lobes of the calyx not leafy. Style flattened above on the back and front, bearded down one face. Pod several-seeded. Seeds sometimes flattish. Leaflets few or several pairs.
42. VICIA. Style slender, bearded or hairy only at the apex or all round the upper part. Pod 2 – several-seeded. Seeds globular or flattish. Leaflets few or many pairs.
43. LENS. Lobes of the calyx slender. Style flattish on the back, and minutely bearded down the inner face. Pod 1 – 2-seeded. Seeds flattened, lenticular. Flowers small.

* * *Leaflets toothed all round, and usually an odd one at the end in place of a tendril: style incurved, naked: radicle of the embryo almost straight.*

44. CICER. Calyx 5-parted. Pod turgid oblong, not flattened, 2-seeded. Seeds large, irregularly rounded-obovate, pointed. Peduncle mostly 1-flowered.

B. *Stamens separate to the base.* (*Plants not twining nor climbing.*)

§ 1. *Leaves simple or of 3 digitate leaflets.*

45. CHORIZEMA. Somewhat shrubby, with simple and spiny-toothed leaves, scarcely any stipules, and orange or copper-red flowers. Standard rounded kidney-shaped: keel straight, much shorter than the wings. Pod ovoid, turgid, several-seeded.
46. BAPTISIA. Herbs, with simple entire sessile leaves and no stipules, or mostly of 3 leaflets with deciduous or persistent stipules. Flowers yellow, blue, or white. Standard erect, with the sides turned back, about equalled by the oblong and straightish wings and keel. Pod inflated, coriaceous, stalked in the calyx, many-seeded.
47. THERMOPSIS. Pod scarcely stalked, linear, flat. Otherwise as Baptisia.

§ 2. *Leaves odd-pinnate.*

48. CLADRASTIS. Trees, with large leaflets, no obvious stipules, and hanging terminal panicles of white flowers. Standard turned back: the nearly separate straightish keel-petals and wings oblong, obtuse. Pod short-stalked in the calyx, linear, very flat, thin, marginless, 4 – 6-seeded. Base of the petioles hollow and covering the axillary leaf-buds of the next year.
49. SOPHORA. Trees, shrubs, or herbs, with numerous leaflets, and mostly white or yellow flowers in terminal racemes or panicles. Keel-petals and wings oblong, obtuse, usually longer than the broad standard. Pod commonly stalked in the calyx, terete, several-seeded, fleshy or almost woody, hardly ever opening, but constricted across into mostly 1-seeded portions.

II. BRASILETTO FAMILY.

Flowers more or less irregular, but not papilionaceous: when they seem to be so the petal answering to the standard will be found to be *within* instead of outside of the other petals. Stamens 10 or fewer, separate. The leaves are sometimes twice pinnate, which is not the case in the true Pulse Family. Embryo of the seed straight, the radicle not turned against the edge of the cotyledons.

§ 1. *Leaves simple and entire. Corolla appearing as if papilionaceous.*

50. CERCIS. Trees, with rounded heart-shaped leaves, minute early deciduous stipules, and small but handsome red-purple flowers in umbel-like clusters on old wood, earlier than the leaves, rather acid to the taste. Calyx short,

5-toothed. Petals 5, the one answering to the standard smaller than the wing-petals and covered by them; the keel-petals larger, conniving but distinct. Stamens 10, declining with the style. Pod linear-oblong, flat, thin, several-seeded, one edge wing-margined.

§ 2. *Leaves simply abruptly pinnate. Calyx and corolla almost regular.*

51. CASSIA. Flowers commonly yellow. Calyx of 5 nearly separate sepals. Petals 5, spreading, unequal (the lower larger) or almost equal. Stamens 10 or 5, some of the upper anthers often imperfect or smaller, their cells opening by a hole or chink at the apex. Pod many-seeded.

§ 3. *Leaves, or at least some of them, twice-pinnate.*

52. CÆSALPINIA. Trees or shrubs, chiefly tropical, with mostly showy red or yellow perfect flowers. Calyx deeply 5-cleft. Petals 5, broad, spreading, more or less unequal. Stamens 10, declining, along with the thread-shaped style. Pod flat.

53. GYMNOCLADUS. Tall, thornless tree, with large compound leaves, no stipules, and diœcious or polygamous whitish regular flowers, in corymb-like clusters or short racemes terminating the branches of the season. Calyx tubular below, and with 5 spreading lobes, the throat bearing 5 oblong petals and 10 short stamens, those of the fertile flowers generally imperfect. Pod oblong, flat, very hard, tardily opening, with a little pulp or sweetish matter inside, containing few or several large and thick hard seeds (over ½′ in diameter); the fleshy cotyledons remaining underground in germination.

54. GLEDITSCHIA. Thorny trees, with abruptly twice pinnate or some of them once pinnate leaves, the leaflets often crenate-toothed, inconspicuous stipules, and small greenish polygamous flowers in narrow racemes. Calyx 3–5-cleft, the lobes and the 3–5 nearly similar petals narrow and spreading. Stamens 3–10. Pod flat, very tardily opening, often with some sweetish matter around the 1–several flat seeds. Cotyledons thin.

III. MIMOSA FAMILY. Flowers perfectly regular, small, crowded in heads or spikes; both calyx and corolla valvate in the bud; and the 4 or 5 sepals usually and petals frequently united more or less below into a tube or cup. Stamens 4, 5, or more, often very many, usually more conspicuous than the corolla and brightly colored, the long capillary filaments inserted on the receptacle or base of the corolla. Embryo of the seed straight. Leaves almost always twice pinnate and with small leaflets, or apparently simple and parallel-veined when they have phyllodia in place of true leaves. The foliage and the pods only show the leguminous character.

§ 1. *Stamens once or twice as many as the petals, 4–10. Ours herbs or nearly so, with rose-colored or whitish flowers, and leaves of many small leaflets.*

55. MIMOSA. Calyx commonly minute or inconspicuous. Corolla of 4 or 5 more or less united petals. Pod flat, oblong or linear: when ripe the valves fall out of a persistent slender margin or frame and also usually break up into one-seeded joints.

56. SCHRANKIA. Calyx minute. Corolla funnel-form, the 5 petals being united up to the middle. Stamens 10. Pod rough-prickly all over, long and narrow, splitting lengthwise when ripe into 4 parts.

57. DESMANTHUS. Calyx 5-toothed. Corolla of 5 separate petals. Stamens 5 or 10. Pod flat, smooth, linear or oblong, 2-valved, no persistent margin.

§ 2. *Stamens numerous, or more than 10. Ours all shrubs or trees.*

58. ALBIZZIA. Flowers flesh-color, rose-color, or nearly white; the long stamens monadelphous at the base. Corolla funnel-form, the 5 petals united beyond the middle. Pod flat and thin, broadly linear, not opening elastically. Leaves twice pinnate.

59. ACACIA. Flowers yellow or straw-color: the stamens separate and very numerous. Corolla of 4 or 5 separate or partly united small petals. Pod various.

1. LUPÌNUS, LUPINE. (Old Latin name, from *lupus*, a wolf, because Lupines were thought to destroy the fertility of the soil.)

* *Wild species of Atlantic States, in sandy soil: fl. in spring.* 2

L. perénnis, WILD L. Somewhat hairy; with erect stem 1° – 1½° high, 7 – 11 spatulate oblong or oblanceolate green leaflets, and a long raceme of showy purplish-blue (rarely pale) flowers, in late spring.

L. villòsus, ONE-LEAVED L. Silky-downy, with short spreading or ascending stems, oblong or lance-oblong simple leaves, and a dense raceme of blue, purple, or rose-colored flowers. Near the coast, from North Carolina S.

* * *Cultivated for ornament: fl. summer.*

L. polyphýllus, MANY-LEAVED L., is the principal hardy perennial species of the gardens, from Oregon and California, 3° – 4° high, rather hairy, with 13 – 15 lanceolate or oblanceolate leaflets, and a very long dense raceme of blue, sometimes purple, variegated, or even white flowers, in June. 2

L. mutábilis, cult. as an annual, from South America, is tall, very smooth throughout, with about 9 narrow-oblong blunt leaflets, and very large sweet-scented violet-purple flowers (or a white variety), with yellow and a little red on the standard.

L. densiflòrus, of California (where there are many fine Lupines), 1° – 2° high, is well marked by the numerous white flowers forming distinct and separate whorls in the long raceme. ①

L. álbus, of Eu., which the ancients cultivated as pulse, has the several obovate-oblong leaflets smooth above, but hairy beneath, white flowers alternate in the raceme, and large smooth pods. ①

L. hirsùtus, cult. in old gardens, from Eu., is clothed with soft white hairs; the leaflets spatulate-oblong; flowers in loose whorls in the raceme, blue, with rose-color and white varieties; pods very hairy. ①

L. lùteus, the old YELLOW L. of the gardens, from Eu., silky-hairy, rather low; with yellow flowers in whorls crowded in a dense spike. ①

2. CROTALÀRIA, RATTLEBOX. (From Greek word for *a rattle*, the seeds rattling in the coriaceous inflated pod.) Native, in sandy soil: fl. yellow, in summer.

C. sagittàlis. Low, 3′ – 6′ high, branching, beset with rusty-colored spreading hairs, with nearly sessile oval or lance-oblong leaves, and 2 or 3 flowers on the peduncle. ①

C. ovàlis. Spreading, rough with appressed hairs; leaves short-petioled, oval, oblong, or lanceolate; peduncle with 3 – 6 scattered flowers. 2

3. GENÍSTA, WOAD-WAXEN, WHIN. (Celtic word: *little bush.*)

G. tinctòria, DYER'S W. or GREEN-WEED. Nat. from Eu. in sterile soil E., especially in Mass.: low and undershrubby, not thorny, with lanceolate leaves, and bright yellow rather small flowers somewhat racemed at the end of the striate-angled green branches, in early summer.

4. CÝTISUS. (Ancient Greek name, after an island where it grows.) The following are the only species generally cultivated.

C. (or **Sarothámnus**) **scopàrius,** SCOTCH BROOM. Shrub, from Europe, 3° – 5° high, smooth, with long and tough erect angled and green branches, bearing small leaves, the lower short-petioled and with 3 obovate leaflets, the upper of a single sessile leaflet, and in the axils large and showy golden yellow flowers on slender pedicels; calyx with 2 short and broad lips; style and stamens slender, held in the keel, but disengaged and suddenly starting upward when touched (as when bees alight on the deflexed keel), the style coiling spirally; pod hairy on the edges. Hardy in gardens N.; running wild in Virginia: fl. early summer.

IRISH BROOM, so called, but is from Portugal, is another species, not hardy here. SPANISH BROOM is SPARTIUM JUNCEUM, of another genus.

C. Canariénsis, from the Canary Islands, is cultivated in conservatories; a shrub with crowded slender branches, soft-hoary leaves of 3 very small obovate leaflets, and small yellow sweet-scented flowers, produced all winter.

5. LABÚRNUM. (Ancient Latin name. Genus separated from Cytisus from the different appearance, and the seeds destitute of strophiole or appendage at the scar.)

L. vulgàre, COMMON LABURNUM, GOLDEN-CHAIN, or BEAN-TREFOIL-TREE of Europe. Planted for ornament, a low tree, with smooth green bark, slender-petioled leaves of 3 oblong leaflets (2′ – 3′ long), and pretty large showy golden-yellow flowers hanging in long racemes, in late spring; pods with one thicker edge.

6. TRIGONÉLLA. (Old name, from Greek word for *triangular*, from the shape of the corolla or the seeds.) Low herbs. T. CÆRÙLEA is the plant used in Switzerland for imparting the flavor like that of Melilot to certain kinds of cheese.)

T. Fœnum-Græcum, FENUGREEK. Occasionally cult. in gardens, in Europe a forage and popular medicinal plant, strong-scented; with wedge-oblong leaflets, one or two nearly sessile small flowers in the axils, yellowish or whitish corolla, and a linear long-pointed and somewhat curved pod 2′ – 4′ long, with veiny sides. ①

7. MEDICÀGO, MEDICK. (The old name of Lucerne, because it came to the Greeks from *Media*.) All natives of the Old World: a few have run wild here. Fl. all summer.

* *Flowers violet-purple or bluish.* ♃

M. sativa, LUCERNE or SPANISH TREFOIL. Cultivated for green fodder, especially S.: stems erect, 1° – 2° high, from a long deep root; leaflets obovate-oblong; racemes oblong; pod several-seeded, linear, coiled about 2 turns.

* * *Flowers yellow.* ① ②

M. lupulìna, BLACK MEDICK, NONESUCH. A weed or pasture plant, in dry or sandy fields, &c.: low, spreading, downy, with wedge-obovate leaflets, roundish or at length oblong heads or spikes of small flowers, and little kidney-shaped 1-seeded pods turning black when ripe.

M. maculàta, SPOTTED M. Waste sandy places, S. & E.: spreading or trailing; with broadly inversely heart-shaped leaflets marked with a dark spot, 3 – 5-flowered peduncles, and a flat pod compactly coiled three or more turns, its thickish edge beset with a double row of curved prickles.

M. denticùlata, like the last, but rarer, with pod of looser coils, sharp edge, and mostly shorter prickles.

M. scutellàta, SNAIL MEDICK, BEEHIVE. Cult. occasionally in gardens for its curious pods, which are pretty large, coiled up like a snail-shell, in many turns, smooth and even.

8. MELILÒTUS, MELILOT, SWEET CLOVER. (From Greek words for *honey* and *Lotus*, i. e. *Sweet Lotus:* foliage sweet-scented, especially in drying.) Natives of the Old World; somewhat cult. in gardens, &c., and running wild in waste or cultivated ground: fl. all summer. ① ②

M. àlba, WHITE M., BOKHARA or TREE CLOVER. Tall, 3° – 6° high, branching, with obovate or oblong leaflets truncately notched at the end, and loose racemes of white flowers. Has been cult. for green fodder.

M. officinàlis, YELLOW M. Less tall, 2° – 3° high, with merely blunt leaflets and yellow flowers.

9. TRIFÒLIUM, CLOVER, TREFOIL. (Latin name: *three leaflets.*)

* *Low, insignificant weeds, nat. from Europe in dry waste fields, &c.* ①

– *Flowers yellow, in round heads, produced through late summer and autumn, reflexed and turning chestnut-brown, dry and papery with age.*

T. agràrium, YELLOW HOP-C. Smoothish, 6′ – 12′ high, with obovate-oblong leaflets all nearly sessile on the end of the petiole; heads rather large.

T. procúmbens, LOW HOP-C. Smaller, spreading, rather downy, the wedge-obovate leaflets notched at the end, the middle one at a little distance from the others.

+ + *Flowers flesh-color or whitish with a purplish spot, in a very soft silky head.*

T. arvénse, Rabbit-foot or Stone C. Erect, silky-downy, especially the oblong or at length cylindrical grayish heads or spikes, the corollas almost concealed by the plumose-silky calyx; leaflets narrow.

* * *Larger, rose-red-flowered Clovers, cult. from Europe for fodder, or running wild: heads thick and dense: corolla tubular, withering away after flowering: flowers sweet-scented, in summer.* 2

T. praténse, Red C. Stems ascending; leaflets obovate or oval, often notched at the end and with a pale spot on the face; head closely surrounded by the uppermost leaves.

T. mèdium, Zigzag C., with a zigzag stem, more oblong entire and spotless leaves, and head usually stalked, is rare, but has run wild E., and passes into the last.

* * * *Low, wild Clovers, or one cult. from Europe, with spreading or running stems, and mostly pale or white flowers (remaining and turning brownish in fading) on pedicels, in round umbels or heads, on slender naked peduncles: fl. spring and summer.*

T. refléxum, Buffalo C. Wild S. and especially W.: somewhat downy, with ascending stems 6′ – 12′ high, obovate-oblong finely-toothed leaflets, heads and rose-red and whitish flowers fully as large as in Red Clover, calyx-teeth hairy, and pods 3 – 5-seeded. ① ②

T. stoloníferum, Running Buffalo C. Prairies and oak-openings W.: like the last, or a variety of it, but some of the stems forming runners, leaflets broadly obovate or inversely heart-shaped, flowers barely tinged with purple, and pods 2-seeded. ① 2

T. Caroliniànum, Carolina C. Fields and pastures S.: a little downy, spreading in tufts 5′ – 10′ high, with small inversely heart-shaped leaflets, broad stipules, and small heads, the purplish corolla hardly longer than the lanceolate calyx-teeth. 2

T. rèpens, White C. Fields, &c. everywhere, invaluable for pasturage: smooth, with creeping stems, inversely heart-shaped leaflets, long and slender petioles and peduncles, narrow stipules, loose umbel-like heads, and white corolla much longer than the slender calyx-teeth. 2

10. PETALOSTÈMON, PRAIRIE CLOVER. (Name composed of the Greek words for *petal* and *stamen* combined.) In prairies, pine-barrens, &c. W. and S.: flowers never yellow. 2

* *Heads crowded in a corymb, leafy-bracted: fl. late in autumn.*

P. corymbòsus. In southern pine-barrens; 2° high, with leaves of 3 – 7 filiform leaflets, and white flowers, the slender teeth of calyx becoming plumose.

* * *Heads or mostly spikes single terminating stems: fl. summer.*

P. violàceus. Prairies W.: smoothish or pubescent, 1° – 2° high, with mostly 5 narrow-linear leaflets, a short spike even when old, rose-purple flowers, and hoary calyx.

P. cárneus. Dry barrens S.: smooth, with branching stems, 5 – 7 linear leaflets, long-peduncled short spikes, flesh-color or pale rose flowers, and glabrous calyx.

P. cándidus. Prairies W. & S.: smooth, 2° – 3° high, with 7 – 9 lanceolate or linear-oblong leaflets, long-peduncled spikes, with awn-pointed bracts, and white flowers.

There are besides one or two rarer species W., and several more far W. & S.

11. DÀLEA. (Named for an English botanist, *Thomas Dale.*) There are many species S. W. beyond the Mississippi.

D. alopecuroìdes. Alluvial river banks W. & S.; with erect stem 1° – 2° high, smooth leaves of many linear-oblong leaflets, and whitish small flowers in a dense silky spike, in summer. ①

12. AMÓRPHA, FALSE INDIGO. (Name, *amorphous*, wanting the ordinary form, from the absence of four of the petals.) There are usually little stipels to the leaflets. Fl. summer.

A. fruticòsa, COMMON A. River-banks from Penn. S. & W.; a tall or middle-sized shrub, smoothish, with petioled leaves of 15–25 oval or oblong leaflets, violet or purple flowers in early summer, and mostly 2-seeded pods.

A. herbàcea (but it is not an herb) of low pine-barrens S., 2°–4° high, often downy, has the leaflets more rigid, dotted, and crowded, villous calyx-teeth, later blue or white flowers, and 1-seeded pods.

A. canéscens, called LEAD-PLANT; in prairies and on rocky banks W. and S. W.; 1°–3° high, hoary with soft down, with sessile leaves of 29–51 elliptical leaflets, smoothish above when old, violet-purple flowers in late summer, and 1-seeded pods.

13. PSORÀLEA. (Greek word for *scurfy*, from the roughish dots or glands on the leaves, calyx, &c.) Wild S. & W.: fl. early summer, violet, bluish, or almost white. ♃

* *Leaves pinnately 3-foliolate, i. e. the side-leaflets a litt'e below the apex of the common petiole, or the uppermost of a single leaflet.*

P. Onóbrychis. River-banks, Ohio to Illinois and S.: 3°–5° high, nearly smooth, with lance-ovate taper-pointed leaflets 3′ long, small flowers in short-peduncled racemes 3′–6′ long; pods rough and wrinkled.

P. melilotoìdes. Dry places, W. & S.: 1°–2° high, somewhat pubescent, slender, with lanceolate or lance-oblong leaflets, oblong spikes on long peduncles, and strongly wrinkled pods.

* * *Leaves digitate, of 3–7 leaflets.*

P. Lupinéllus. Dry pine-barrens S.: smooth and slender, with 5–7 very narrow or thread-shaped leaflets, small flowers in loose racemes, and obliquely wrinkled pods.

P. floribúnda. Prairies from Illinois S. W.: bushy-branched and slender, 2°–4° high, somewhat hoary when young, with 3–5 linear or obovate-oblong much dotted leaflets, small flowers in short panicled racemes, and glandular-roughened pods.

P. canéscens. Dry barrens S. E. Bushy-branched, 2° high, hoary-pubescent, with 3 (or upper leaves of single) obovate leaflets, loose racemes of few flowers, and a smooth pod.

P. argophýlla. Prairies N. W., mostly across the Mississippi, widely branched, 1°–3° high, silvery white all over with silky hairs, with 3–5 broad-lanceolate leaflets and spikes of rather few largish flowers.

P. esculénta, POMME BLANCHE of the N. W. Voyageurs; the turnip-shaped or tuberous mealy root furnishing a desirable food to the Indians N. W.: low and stout, 5′–15′ high, roughish hairy, with 5 lance-oblong or obovate leaflets, a dense oblong spike of pretty large (½′ long) flowers, and a hairy pointed pod.

4. ONÓBRYCHIS, SAINFOIN. (Name from Greek, means *Asses-food.*)

O. satíva, COMMON S. Sparingly cult. from Europe as a fodder plant, but not quite hardy N.; herb 1°–2° high, with numerous oblong small leaflets, brown and thin pointed stipules, and spikes of light pink flowers on long axillary peduncles, in summer, the little semicircular pod bordered with short prickles or teeth. ♃

15. STYLOSÁNTHES, PENCIL-FLOWER. (Name from Greek words for *column* and *flower*, the calyx being raised on its stalk-like base. The application of the popular name is not obvious.)

S. elàtior, of pine-barrens from New Jersey and Illinois S., is an inconspicuous low herb, in tufts; the wiry stems downy on one side; leaflets lanceolate, with strong straight veins; flowers orange-yellow, small, in little clusters or heads, in late summer. ♃

16. LESPEDÈZA, BUSH-CLOVER. (Named for *Lespedez*, a Spanish Governor of Florida.) All grow in sandy or sterile soil; fl. late summer and autumn. 2

* *Native species: stipules and bracts minute.*

+ *Flowers in close spikes or heads on upright* (2° – 4° *high*) *simple rigid stems: corolla cream-color or white with a purple spot, about the length of the silky-downy calyx.*

L. capitàta. Leaflets oblong or sometimes linear, silky beneath, thickish; peduncles and petioles short; flowers in short spikes or heads; calyx much longer than the pod.

L. hírta. Leaflets roundish or oval, hairy or downy; petioles and peduncles slender; spikes becoming rather long and loose.

+ + *Flowers violet-purple, scattered or in open panicles or clusters, slender-peduncled, also usually some more fertile ones, mostly without petals, in small sessile clusters.*

L. violàcea. The commonest, and very variable, bushy-branching, erect or spreading, with leaflets varying from oval to linear, and minutely whitish-downy beneath, or sometimes silky; the ordinary flowers loosely panicled.

L. procúmbens. Soft-downy, except the upper surface of the oval or oblong leaflets, slender and trailing; peduncles slender and few-flowered.

L. rèpens. Smooth, except some minute and scattered close-pressed hairs, very slender, prostrate; leaflets obovate or oval ($\frac{1}{2}'$ long).

* * *Naturalized in States, from China or Japan: stipules ovate or lance-ovate, striate, longer than the very short petiole.*

L. striàta. Introduced (more than 25 years ago) in some unknown way into the Southern Atlantic States, now rapidly spreading and occupying old fields and waste places, to the great benefit of the country, being greedily fed upon by cattle; it is low and spreading, 3′ – 10′ high, much branched, almost smooth, with oblong or wedge-oblong leaflets $\frac{1}{4}' - \frac{1}{2}'$ long, and 1 – 3 small purplish flowers almost sessile in the axils.

17. DESMÒDIUM, TICK-TREFOIL. (Name from Greek, means *bound together*, from the connected joints of the pod.) 2 We have many native species, common in open woods and copses; fl. late summer: the following are the more common.

§ 1. *Native species: the little joints of the pod adhere to clothing or to the coats of animals: flowers sometimes turning greenish in withering.*

* *Pod raised far above the calyx on a slender stalk of its own, straightish on the upper margin, divided from below into not more than 4 joints: flowers in one long-stalked naked terminal raceme or panicle: plants smooth,* 1° – 3° *high: stipules bristle-form.*

D. nudiflòrum. Flower-stalk and leaf-bearing stem rising separately from a common root; the leaves all crowded on the summit of the latter, and with broadly ovate bluntish leaflets, pale beneath.

D. acuminàtum. Flower-stalk terminating the stem, which bears a cluster of leaves; the large leaflets (4′ – 5′ long) round-ovate with a tapering point, or the end one blunter, green both sides.

* * *Pod little if at all raised above the calyx.*

+ *Stems erect,* 3° – 6° *high: stipules large, ovate or lance-ovate and pointed, striate, persistent, the bracts similar but deciduous: flowers large for the genus: racemes panicled: pods of* 4 – 7 *rhombic-oblong joints, each joint about* $\frac{1}{2}'$ *long.*

D. cuspidàtum. Very smooth, with a straight stem, lance-ovate and taper-pointed leaflets (3′ – 5′ long) longer than the common petiole, and pod with smoothish joints.

D. canéscens. Hairy, with branching stems, pale leaves; the ovate bluntish leaflets about the length of the common petiole, reticulated beneath and both sides roughish with fine close pubescence; joints of pod very adhesive.

+– +– *Stems erect, 2° – 6° high: stipules and bracts mostly awl-shaped, small and inconspicuous or early deciduous: racemes panicled.*

++ *Common petiole slender: flowers smallish: joints of pod 3 – 5, unequal-sided.*

D. viridiflòrum. Stem and lower surface of the broad ovate blunt leaflets clothed with white and soft-velvety down. Pine-barrens, from New Jersey S.

D. lævigàtum. Stem and the thickish ovate and bluntish leaflets smooth or nearly so. From New Jersey S.

D. Dillènii. Stem and the oblong or oblong-ovate bluntish thin leaflets finely pubescent; the latter 2′ – 3′ long.

D. paniculàtum. Smooth or nearly so throughout; leaflets lanceolate or lance-oblong, tapering to a blunt point, 3′ – 5′ long; panicle loose.

D. strictum. Slender stems smooth below, above and the narrow panicle rough-glandular; leaflets linear, blunt, reticulated, very smooth, 1′ – 2′ long. From New Jersey S.

++ ++ *Common petiole very short.*

D. Canadénse. Stem hairy, 3° – 6° high, leafy up to the panicle; leaflets lance-oblong, blunt, 2′ – 3′ long; racemes dense, the pink-purple flowers larger than in any other, fully ½′ long; bracts large, conspicuous before flowering. Chiefly N. & W.

D. sessilifòlium. Stem pubescent, 2° – 4° high; the long panicle naked; common petiole hardly any; leaflets linear or linear-oblong, blunt, reticulated, rough above, downy beneath; flowers small. Penn. to Ill. & S.

+– +– +– *Stems ascending or spreading, 1° – 3° long: stipules and bracts awl-shaped and deciduous: panicle naked, loose: flowers small: pod of 2 or 3 small oval or roundish joints.*

D. rígidum. The largest of this section, with rough-pubescent stems sometimes erect; leaflets ovate-oblong, blunt, thickish, roughish and reticulated, 1′ – 2½′ long, longer than the common petiole.

D. ciliàre. More or less hairy, slender, very leafy; common petiole very short; leaflets round-ovate or oval, thickish, ½′ – 1′ long.

D. Marilándicum. Smooth or nearly so, slender; leaflets ovate or roundish, thin, the lateral ones about the length of the slender petiole: otherwise like the preceding.

+– +– +– +– *Stems reclining or prostrate: racemes axillary and terminal.*

D. lineàtum. Smoothish; stem striate-angled; stipules awl-shaped, deciduous; leaflets orbicular, 1′ or less in length, much longer than the common petiole; flowers and 2 or 3 rounded joints of the pod small. Pine-barrens from Maryland S.

D. rotundifòlium. Soft-hairy; stems running 3° – 5° along the ground; leaflets orbicular, about 3′ long; stipules ovate, striate, taper-pointed, persistent; flowers and the 3 – 5 rhombic-oval joints of the pod rather large.

§ 2. *Exotic, conservatory species.*

D. gỳrans, of East Indies, one of the most extraordinary plants known, is readily grown as a tender annual: the smooth leaves are remarkable for their movements; the end leaflet slowly changing position with the light; the lateral ones, very much smaller, moving pretty rapidly up and down, in elliptical sweeps, through the day when the temperature is about 80° Fahr.

18. ÆSCHYNÓMENE, SENSITIVE JOINT-VETCH. (From Greek word meaning *ashamed*, the leaflets of some species being more or less sensitive to the touch in the manner of the common Sensitive Plant.) Stamens commonly in two sets of 5 each. Pod resembling that of Desmodium. Fl. summer.

Æ. hispida. Stem rough-bristly, 2° – 4° high; leaflets very many, broadly linear; joints of the bristly pod 6 – 10, nearly square. Low grounds from Penn. S. ①

Æ. viscídula. Stems clammy-pubescent, slender, spreading on the ground; leaflets 7 – 9, obovate; joints of the bristly pod 2 or 3, half-orbicular. Sandy shores S. ①

19. CORONÍLLA. (Latin, diminutive of *corona*, a crown.) Cult. from Europe for ornament. 2

C. vària, PURPLE CORONILLA. Hardy herb, spreading from underground running shoots, smooth, 2° high, with 15 – 21 obovate-oval or oblong small leaflets, and head-like umbels of handsome pink-purple and white or white and lilac flowers, all summer.

C. glaùca, YELLOW SWEET-SCENTED C. Green-house shrubby plant, with 5 – 9 glaucous obovate or obcordate leaflets, the terminal largest, and head-like umbels of sweet-scented yellow flowers; the claws of the petals not lengthened.

20. ÁRACHIS, PEANUT, GROUND-NUT. (Meaning of name obscure.)

A. hypogæa, the only common species, originally from South America, cult. S.: the nut-like pods familiar, the oily fleshy seeds being largely eaten by children, either raw or roasted. ①

21. SESBÁNIA. (Arabic name *Sesban*, a little altered.) Fl. late summer.

S. macrocárpa, wild in swamps S., is tall, smooth, with linear-oblong leaflets, few flowers on a peduncle shorter than the leaves, the corolla yellow with some reddish or purple, followed by linear narrow hanging pods 8′ – 12′ long, containing many seeds. ①

S. vesicària (or GLOTTÍDIUM FLORIDÀNUM), in low grounds S., resembles the preceding in foliage and small yellow flowers, but has a broadly oblong turgid pod, only 1′ or 2′ long, pointed, raised above the calyx on a slender stalk of its own, only 2-seeded, the seeds remaining enclosed in the bladdery white lining of the pod when the outer valves have fallen. ①

S. grandiflòra (or AGÀTI GRANDIFLORA), a shrub or tree-like plant of India, run wild in Florida, occasionally cult. for ornament S., has very large flowers, 3′ – 4′ long, white or red, and slender hanging pods 1° or so long.

22. CARAGÀNA, PEA-TREE. (Tartar name.) Natives of Siberia and China: planted for ornament, but uncommon, scarcely hardy N.

C. arboréscens. SIBERIAN P. Shrub or low tree, with spiny stipules, 4 – 6 pairs of oval-oblong downy leaflets, a soft tip to the common petiole, and solitary yellow flowers, in spring.

C. frutéscens, has soft stipules, and only 2 pairs of obovate leaflets crowded at the summit of the petiole, which is tipped with a spiny point.

C. Chamlàgu, CHINESE P., a low or spreading shrub, has 2 rather distant pairs of smooth oval or obovate leaflets, the stipules and tip of the petiole spiny.

23. INDIGÓFERA, INDIGO-PLANT. (Name means *producer of indigo.*) Ours are tall perennials, sometimes with woody base, and numerous small flowers in racemes, of S. States, in dry soil: fl. summer.

I. Caroliniàna. Wild from North Carolina S.: smoothish, with 10 – 15 obovate or oblong pale leaflets, racemes longer than the leaves, flowers soon brownish, and oblong veiny pods only 2-seeded.

I. tinctòria. This and the next furnish the indigo of commerce, were cult. for that purpose S., and have run wild in waste places: woody at base, with 7 – 15 oval leaflets, racemes shorter than the leaves, the deflexed knobby terete pods curved and several-seeded.

I. Anil differs mainly in its flattish and even pods thickened at both edges.

24. TEPHRÒSIA, HOARY PEA. (From Greek word meaning *hoary.*) Native plants, of dry, sandy or barren soil, chiefly S.: fl. summer.

* *Stem very leafy up to the terminal and sessile dense raceme or panicle.*

T. Virginiàna. Called CATGUT, from the very tough, long and slender roots; white silky-downy, with erect and simple stem 1° – 2° high, 17 – 29 linear-oblong leaflets, pretty large and numerous flowers yellowish-white with purple, and downy pods. Common N. & S.

* * *Stems branching, often spreading or decumbent: leaves scattered: racemes opposite the leaves, long-peduncled: flowers fewer and smaller: pubescence mostly yellowish or rusty.*

T. spicàta. From Delaware S.: 1° – 2° high, loosely soft-hairy, with 9 – 15 wedge-oblong or obovate leaflets, and 6 – 10 rather large scattered white and purple flowers in the raceme or spike.

T. hispídula. From Virginia S.: low, closely pubescent or smoothish, with 11 – 15 oblong small leaflets, the lowest pair above the base of the petiole, and 2 – 4 small reddish-purple flowers.

T. chrysophýlla. From Georgia S. & W.: nearly prostrate, with 5 – 7 wedge-obovate leaflets, smooth above and yellowish silky beneath, the lowest pair close to the stem; flowers as in the last.

25. ROBÍNIA, LOCUST-TREE. (Dedicated to two early French botanists, *Robin.*) Natives of Atlantic, Middle, and Southern States, planted, and the common Locust running wild N. Fl. late spring and early summer.

R. Pseudacàcia, Common L. or False Acacia. Tree of valuable timber, with naked branchlets, slender and loose hanging racemes of fragrant white flowers, and smooth pods.

R. viscòsa, Clammy L. Smaller tree, with clammy branches and stalks, very short prickles, short and dense racemes of faintly rose-colored scentless flowers, and rough clammy pods.

R. híspida, Bristly L. or Rose-Acacia. Ornamental shrub, with branches and stalks bristly, broad leaflets tipped with a long bristle, large and showy bright rose-colored flowers in close or loose racemes, and clammy-bristly pods.

26. COLÙTEA, BLADDER-SENNA. (Derivation of name obscure: the English name refers to the bladdery pods and to the leaves having been used as a substitute for those of Senna.)

C. arboréscens, Common B. European shrub, planted in gardens, with 7 – 11 oval and rather truncate leaflets, a raceme of 5 – 10 yellow flowers, in summer, succeeded by the large very thin-walled closed pods.

C. cruénta, Oriental B., with obovate notched leaflets, fewer flowers saffron-colored or reddish, and pods opening by a little slit before they are ripe, is scarcely hardy N.

27. ASTRÁGALUS, MILK-VETCH. (Old Greek name of the ankle-bone and of some leguminous plant; application and meaning uncertain.) Very many native species west of the Mississippi.

A. Canadénsis. River-banks, the only widely common species; rather coarse, 1° – 4° high, slightly pubescent, with leaves of numerous leaflets, long dense spikes of greenish cream-colored flowers, in summer, followed by small and coriaceous ovoid pods, completely divided by a longitudinal partition. 2/

A. Coòperi. Gravelly shores N. & W.: resembles the foregoing, but smoother, 1° – 2° high, with small white flowers in a short spike, and inflated ovoid pods about 1′ long, thin-walled, and not divided internally; fl. in early summer. 2/

A. glàber. Pine-barrens S.: nearly smooth, 2° high, with very many oblong-linear small leaflets, loosely many-flowered spikes of white flowers, in spring, succeeded by oblong curved and flattish 2-celled pods. 2/

A. caryocárpus, Ground Plum of the Western *voyageurs*, so called from the fruit, which is of the size and shape of a small plum, and fleshy, but becoming dry and corky, very thick-walled, 2-celled; the plant low, smoothish, with many small narrow oblong leaflets, and short racemes or spikes of violet-purple or nearly white flowers, in spring: common along the Upper Mississippi and W. and S. on the plains. 2/

A. villòsus. Pine-barrens S.: low and spreading, loosely hoary-hairy, with about 13 oblong leaflets notched at the end, a short and dense raceme or spike of small yellowish flowers, in spring, and an oblong 3-angled curved and soft-hairy pod, its cavity not divided. 2/

28. WISTÀRIA. (Named for *Prof. Wistar* of Philadelphia.) Very ornamental woody twiners: fl. spring.

W. frutéscens, American W. Wild along streams W. and S., and cult. for ornament; soft-downy when young, with 9 – 15 lance-ovate leaflets, a dense raceme of showy blue-purple flowers, the calyx narrowish, wing-petals each with one short and one very long appendage at the base of the blade, and a smooth ovary.

W. Sinénsis, Chinese W. Cult. from China or Japan, barely hardy in New England, faster growing (sometimes 20° in a season) and higher climbing than the other, with longer and more pendent racemes, wing-petals appendaged on one side only, and a downy ovary. Often flowering twice in the season.

29. ÁPIOS, GROUND-NUT, WILD BEAN. (Name from Greek word for *pear*, from the shape of the tubers.) 2

A. tuberòsa. Wild in low grounds; subterranean shoots bearing strings of edible farinaceous tubers 1′ – 2′ long; stems slender, rather hairy; leaflets ovate-lanceolate; flowers brownish-purple, violet-scented, crowded in short and thick racemes, in late summer and autumn.

30. ERYTHRÌNA. (From Greek word for *red*, which is the usual color of the flowers.)

E. herbàcea. Wild in sandy soil near the coast S.; sending up herbaceous stems 2° – 4° high from a thick woody root or base, some leafy, the leaflets broadly triangular-ovate; others nearly leafless, terminating in a long erect raceme of narrow scarlet flowers, of which the straight and folded lanceolate standard (2′ long) is the only conspicuous part; seeds scarlet: fl. spring.

E. Crista-gálli. Cult. in conservatories, from Brazil; with a tree-like trunk, oval or oblong leaflets, and loose racemes of crimson large flowers, the keel as well as the broad spreading standard conspicuous, the rudimentary wings hidden in the calyx.

31. PHASÈOLUS, BEAN, KIDNEY BEAN. (An ancient name of the Bean.) Fl. summer and autumn.

* *Native species, small-flowered.*

P. perénnis. From Connecticut and Illinois S. in woody places; slender stems climbing high; leaflets roundish-ovate, short-pointed; racemes long and loose, often panicled; flowers small, purple; pods drooping, scimitar-shaped, few-seeded. 2

P. diversifòlius. Sandy shores, &c.: spreading on the ground, with rough hairy stems, ovate entire or commonly 3-lobed or angled leaflets, peduncles twice the length of the leaves, bearing a small cluster of purplish or at length greenish flowers, and linear nearly terete straight pods. ①

P. hélvolus. Sandy soil, from New Jersey and Illinois S.: more slender than the preceding, sometimes twining a little, with the ovate or oblong leaflets entire or obscurely angled, peduncles several times surpassing the leaves, flowers pale purple, and pods narrower. 2

P. pauciflòrus. River-banks W. & S.: spreading over the ground, also twining more or less, slender, pubescent, with small oblong-lanceolate or linear leaflets, few and small purplish flowers on a short peduncle, the keel merely incurved, and the straight flat pod only 1′ long. ①

* * *Exotic species, cultivated mainly for food, all with ovate pointed leaflets.* ①

P. vulgàris, Common Kidney, String, and Pole Bean. Twining, with racemes of white or sometimes dull purplish or variegated flowers shorter than the leaf, linear straight pods, and tumid seeds. Many varieties, among which may be reckoned the next.

P. nànus, Dwarf or Field Bean; low and bushy, not twining; seeds very tumid.

P. lunàtus, Lima Bean, Sieva B., &c. Twining, with racemes of small greenish-white flowers shorter than the leaf, and broad and curved or scimitar-shaped pods, containing few large and flat seeds.

P. multiflòrus, Spanish Bean, Scarlet Runner when red-flowered; twining high, with the showy flowers bright scarlet, or white, or mixed, in peduncled racemes surpassing the leaves; pods broadly linear, straight or a little curved; seeds large, tumid, white or colored.

* * * *Exotic species, cultivated in greenhouses for ornament.* 2l

P. Caracálla, Snail-Flower. Stem twining extensively, rather woody below, from a tuberous root; leaflets rhombic-ovate, taper-pointed; racemes longer than the leaf; flowers showy, 2′ long, white and purple, the standard as well as the very long-snouted keel spirally coiled, giving somewhat the appearance of a snail-shell.

32. DÓLICHOS, BLACK BEAN, &c. (Old Greek name of a Bean, meaning *elongated,* perhaps from the tall-climbing stems.)

D. Láblab, Egyptian or Black Bean, cult. from India, for ornament and sometimes for food, is a smooth twiner, with elongated racemes of showy violet, purple, or white flowers, 1′ long, and thick and broadly oblong pointed pods; seeds black or tawny with a white scar. ①

D. Sinénsis, China Bean, var. **melanophthálmus,** Black-eyed Bean, with long peduncles bearing only 2 or 3 (white or pale) flowers at the end, the beans (which are good) white with a black circle round the scar, is occasionally met with.

33. GALÁCTIA, MILK-PEA. (From a Greek word for *milky,* which these plants are not.) There are several other species in the Southern Atlantic States; a rare one has pinnate leaves. Fl. summer. 2l

G. glabélla. Sandy soil from New Jersey S.: prostrate, nearly smooth, with rather rigid ovate-oblong leaflets, their upper surface shining, a few rather large rose-purple flowers on a peduncle not exceeding the leaves, and a 4 – 6-seeded at length smoothish pod.

G. móllis. Sandy barrens, from Maryland S.: spreading, seldom twining, soft-downy and hoary, even to the 8 – 10-seeded pod; racemes long-peduncled, many-flowered; leaflets oval.

34. AMPHICARPÆA, HOG-PEA-NUT. (Name from Greek words meaning *double-fruited,* alluding to the two kinds of pod.) 2l

A. monoìca. A slender much-branched twiner, with brownish-hairy stems, leaves of 3 rhombic-ovate thin leaflets, and numerous small purplish flowers in clustered drooping racemes, besides the more fertile subterranean ones; the turgid pods of the latter hairy: herbage greedily fed upon by cattle: fl. late summer and autumn.

35. CENTROSÈMA, SPURRED BUTTERFLY-PEA. (Name from Greek words meaning *spurred standard.*) 2l

C. Virginiànum. Sandy woods, chiefly S.: trailing and low twining, slender, roughish with minute hairs; leaflets varying from ovate-oblong to linear, very veiny, shining; the 1 – 4-flowered peduncles shorter than the leaves; the showy violet-purple flowers 1′ or 1½′ long, in summer.

36. CLITÒRIA, BUTTERFLY-PEA. (Derivation obscure.) 2l

C. Mariàna, our only species, in dry ground from New Jersey S.: smooth, with erect or slightly twining stem (1° – 3° high), ovate-oblong leaflets pale beneath, very showy light blue flowers 2′ long, single or 2 – 3 together on a short peduncle, and a few-seeded straight pod: fl. summer.

37. HARDENBÉRGIA. (Named for an Austrian botanist.) Australian plants. 2l

H. monophýlla, a choice greenhouse plant, has leaves of a single ovate or lanceolate leaflet 2′ or 3′ long, and slender racemes of small violet-purple flowers; whole plant smooth.

38. KENNÉDYA. (Named for a distinguished English florist.) Australian plants, of choice cultivation in conservatories. ♃

K. rubicúnda, is hairy, free-climbing, with 3 ovate leaflets, and 2 – 4 flowered peduncles, the dark red or crimson flowers over 1′ long.

39. RHYNCHÒSIA. (Name from the Greek, means *beaked*, of no obvious application.) Chiefly Southern : fl. summer. ♃

R. tomentòsa. Low, soft-downy, in several varieties, erect, spreading, or the taller forms twining more or less, with one or three round or sometimes oblong-oval leaflets, and clusters or racemes of small yellow flowers. Dry sandy soil, from Maryland S.

R. galactoìdes. Bushy-branched, 2° – 4° high, not at all disposed to twine, minutely pubescent, with 3 small and rigid oval leaflets, hardly any common petiole, and scattered flowers in the upper axils, the standard reddish outside. Dry sand-ridges, from Alabama S.

40. PÌSUM, PEA. (The old Greek and Latin name of the Pea.) ①

P. satìvum, Common Pea. Cult. from the Old World : smooth and glaucous, with very large leafy stipules, commonly 2 pairs of leaflets, branching tendrils, and peduncles bearing 2 or more large flowers ; corolla white, bluish, purple, or party-colored ; pods rather fleshy.

41. LÁTHYRUS, VETCHLING. (Old Greek name.) Some species closely resemble the Pea, others are more like Vetches. Fl. summer.

* *Cult. from Eu., for ornament : stem and petioles wing-margined : leaflets one pair.*

L. odoràtus, Sweet Pea. Stem more or less roughish-hairy ; leaflets oval or oblong ; flowers 2 or 3 on a long peduncle, sweet-scented, white with the standard rose-color, or purple, with varieties variously colored. ①

L. latifòlius, Everlasting Pea. Smooth, climbing high ; stems broadly winged ; leaflets oval, with parallel veins very conspicuous beneath ; flowers numerous in a long-peduncled raceme, pink-purple, also a white variety, scentless. ♃

* * *Native species : stems wingless or merely margined : leaflets* 2 – 8 *pairs.* ♃

L. marítimus, Beach Pea. Sea-shore of New England especially N., and along the Great Lakes : about 1° high, leafy, smooth, with stipules nearly as large as the 8 – 16 oval crowded leaflets, and the peduncle bearing 6 – 10 rather large purple flowers.

L. venòsus. Shady banks W. & S. : climbing, with 10 – 17 more scattered ovate or oblong leaflets, often downy beneath, small and slender stipules, and peduncles bearing many purple flowers.

L. ochroleùcus. Hillsides and banks N. & W. : slender stems 1° – 3° high ; the leaflets 6 – 8, glaucous, thin, ovate or oval, larger than the leafy stipules ; peduncles bearing several rather small yellowish-white flowers.

L. palústris. Swamps and wet grounds N. & W. : low, 1° – 2° high, with margined or slightly winged stems, small lanceolate stipules, 4 – 8 leaflets varying from linear to oblong, and peduncles bearing 3 – 5 rather small purple flowers.

Var. **myrtifòlius,** common W. & S., usually appears very distinct, climbing 2° – 4° high, with oblong or oval leaflets, larger and more leaf-like upper stipules, and paler flowers.

42. VÍCIA, VETCH, TARE. (The old Latin name of the genus.)

§ 1. *Flowers several or many on a slender peduncle, in spring or summer : pod several-seeded : wild species in low ground,* 1° – 4° *high.* ♃

* *Peduncle* 4 – 8*-flowered : plant smooth.*

V. Americàna. Common N. & W. ; with 10 – 14 oblong and very blunt veiny leaflets, and purplish flowers over ½′ long.

V. acutifòlia. Near the coast S. ; with about 4 linear or oblong leaflets, and small blue or purplish flowers.

* * *Peduncle bearing very many small soon reflexed flowers.*

V. Caroliniàna. Smoothish; with 8 – 24 oblong blunt leaflets, and small white or purplish-tipped flowers rather loose or scattered in the slender raceme.

V. Crácca. Only N. & W., rather downy; with 20 – 24 lance-oblong mucronate-pointed leaflets, and a dense spike of blue flowers (nearly ½′ long) turning purple.

§ 2. *Flowers* 1 – 5 *on a slender peduncle, in summer or spring, very small: leaflets oblong-linear,* 4 – 8 *pairs: pod oblong, only* 2 – 4*-seeded: slender and delicate European plants, run wild in fields and waste places.* ①

V. tetraspérma. Leaflets blunt; corolla whitish; pod 4-seeded, smooth.

V. hirsùta. Leaflets truncate; corolla bluish; pod 2-seeded, hairy.

§ 3. *Flowers single or few and sessile or short-peduncled in the axil of the leaves, pretty large: pod several-seeded: stem simple, low, not climbing.* ①

V. satìva, Common Vetch or Tare. Sometimes cult. for fodder, from the Old World, run wild in some fields: somewhat hairy, with 10 – 14 leaflets varying from oblong or obovate to linear, and notched and mucronate at the apex; flowers mostly in pairs and sessile, violet-purple; seeds tumid.

V. Fàba, Bean of England, Windsor or Horse-Bean. Cult. from the Old World for the edible beans (which are not much fancied in this country, where we have better): smooth, with stout erect stem 1° – 2° high, crowded leaves of 2 – 6 oblong leaflets (1½′ – 3′ long), a mere rudiment of a tendril, and axillary clusters of white flowers having a black spot on each wing; pod thick and fleshy, 2′ – 3′ long; seeds oval, flattened, large.

43. LENS, LENTIL. (Classical Latin name. The shape of the seed gave the name to the glass lens for magnifying.) ①

L. esculénta, Common Lentil, of Europe, cult. for fodder and for the seeds, but rarely with us: slender plant, barely 1° high, resembling a Vetch, with several pairs of oblong leaflets (½ long), 2 or 3 small white or purplish flowers on a slender peduncle, and a small broad pod, containing 2 orbicular sharp-edged (lens-shaped) seeds, which are generally yellowish or brownish, a sorry substitute for beans, but good for soup.

44. CÌCER, CHICK-PEA. (An old Latin name for the Vetch.) ①

C. arietìnum, Common C., of the Old World, called Coffee-Pea at the West, there cult. for its seeds, which are used for coffee: their shape gave the specific name, being likened to the head of a sheep: plant 9′ – 20′ high, covered with soft glandular acid hairs; leaves of 8 – 12 wedge-obovate serrate leaflets; peduncle bearing one small whitish flower, succeeded by the turgid small pod.

45. CHORIZÈMA. (A fanciful name of Greek derivation.) ♃

C. ilicifòlia, Holly-leaved C. Greenhouse-plant from Australia, bushy, with lance-oblong leaves cut into strong spiny teeth or lobes, and racemes of small copper-colored flowers, the wings redder.

46. BAPTÍSIA, FALSE INDIGO. (From Greek word meaning *to dye*, these plants yielding a poor sort of indigo.) Foliage of most species turning blackish in drying: nearly all grow in sandy or gravelly dry soil: fl. spring and early summer. ♃

* *Flowers yellow.*

B. perfoliàta. Low and spreading, smooth and glaucous, with simple round-ovate leaves surrounding the stem (perfoliate, probably answering to united stipules), and single small flowers in their axils; pod small and globular. Carolina and Georgia.

B. tinctòria, Common or Wild False-Indigo. Pale or glaucous, smooth, bushy, 2° high, with 3 small wedge-obovate leaflets, hardly any common petiole, minute deciduous stipules, few-flowered racemes terminating the branches, and small globular pods.

B. lanceolàta. Downy when young, spreading, with 3 thickish blunt leaflets varying from lanceolate to obovate, a very short common petiole, small deciduous stipules, and rather large flowers solitary in the axils and in short terminal racemes, the pod globular and slender-pointed. Common S. & S. W.

B. villòsa. Minutely downy, with stout stems 2° high, 3 spatulate-oblong or wedge-obovate leaflets, becoming smooth above, a very short common petiole, stipules more or less persistent, and many-flowered racemes of large flowers on slender pedicels; the pod minutely downy, oblong, taper-pointed. From Carolina S. W.

* * *Flowers white, in the first cream-color: leaves all of 3 leaflets varying from wedge-obovate to oblanceolate, and flowers in long racemes terminating the branches.*

B. leucophæa. Low and spreading, 1° high, soft-hairy, with persistent large and leaf-like bracts and stipules, reclined one-sided racemes of cream-colored large (1′ long) flowers on slender pedicels, and hoary ovate pods. Open woods, chiefly W.

B. álba. Smooth, 2° – 3° high, with slender widely spreading branches, slender petioles, minute deciduous stipules and bracts, loose erect or spreading long-peduncled racemes of small flowers (½′ – ⅓′ long), and cylindrical pods. From Virginia S.

B. leucántha. Smooth and glaucous, stout, 3° – 5° high, with spreading branches, rather short petioles, the lanceolate stipules and bracts deciduous, erect long racemes of large (1′ long) flowers, and oval-oblong pods 2′ long, raised on a stalk fully twice the length of the calyx. Alluvial soil, from Ohio W. & S.

* * * *Flowers blue: leaves of 3 leaflets as in the foregoing.*

B. austràlis. Smooth and stout, pale, erect, 2° – 5° high, with oblong-wedge-shaped leaflets, lanceolate and rather persistent stipules as long as the short petiole, erect racemes of pretty large (nearly 1′ long) flowers on short pedicels, and oval-oblong pods 2′ – 3′ long, on a stalk of the length of the calyx.

47. THERMÓPSIS. (From Greek words meaning that the plants resemble the Lupine.) Flowers yellow. ♃

T. móllis. Wild in open woods from N. Carolina S.: downy, 1° – 2° high, with spreading branches, 3 obovate-oblong leaflets, oblong-ovate leafy stipules, some of them as long as the short petioles, and long narrow-linear spreading pods short-stalked in the calyx: fl. spring. (There are two other species in the Southern Alleghanies.)

T. fabàcea, which is erect with oval leaflets and upright pods, is sparingly cult. from Siberia, and wild in N. W. America.

48. CLADRÁSTIS, YELLOW-WOOD. (Meaning of name obscure, perhaps from Greek for brittle branches.)

C. tinctòria (also named VIRGÍLIA LÙTEA), native of rich woods from E. Kentucky S., planted for ornament, one of the very handsomest and neatest of ornamental trees; with light yellow wood, a close bark like that of Beech, leaves of 7 – 11 parallel-veined oval or ovate leaflets (3′ – 4′ long and smooth, as is the whole plant), and ample hanging panicles (1° or more long) of pretty, delicately fragrant, cream-white flowers, terminating the branchlets of the season, in May or June.

49. SOPHÒRA. (An Arabic name altered.) There is a wild herbaceous species beyond the Mississippi, a low shrubby one on the coast of Florida, and a tree in Arkansas and Texas which in its fleshy jointed pod and in appearance much resembles the following: —

S. Japónica, JAPAN S. Planted for ornament, hardy to New England; tree 20° – 50° high, with greenish bark, 11 – 13 oval or oblong acute smooth leaflets, and loose panicles of cream-white flowers, terminating the branches at the end of summer, the fruit a string of fleshy 1-seeded joints.

50. CÉRCIS, RED-BUD, JUDAS-TREE. (Ancient name of the oriental species: the English name from the old notion that this was the tree whereon Judas hanged himself.)

C. Canadénsis, AMERICAN RED-BUD. Wild from New York S. (but probably not in Canada as the name implies): a small, handsome tree, ornamental in spring, when the naked branches are covered with the small but very numerous flowers, of the color of peach-blossoms or redder; the rounded leaves are somewhat pointed, and the pods scarcely stalked in the calyx.

C. Siliquástrum, EUROPEAN R. or JUDAS-TREE. Barely hardy N., except as a shrub; has larger flowers, pod raised out of the calyx on a short stalk, and almost kidney-shaped leaves. A seeming variety of this inhabits Texas and California.

51. CÁSSIA, SENNA. (Ancient name, of obscure meaning.) The following all wild species, the first sometimes cult. in country gardens, and the leaves used in place of true, oriental Senna. Fl. summer, in all ours yellow.

§ 1. *Smooth herbs, in rich or alluvial soil, with rather large leaflets, deciduous stipules, flowers in short axillary racemes or crowded in a panicle, and the* 10 *stamens unequal, some of the upper anthers imperfect.*

C. Marilándica, WILD SENNA. The only common sort at the north, 3°–4° high, with 6–9 pairs of narrow-oblong blunt and mucronate leaflets, a club-shaped gland on the common petiole near the base, bright yellow petals often turning whitish when old, blackish anthers, and linear flat (at first hairy) pods. 2/

C. occidentàlis, WESTERN S. or STYPTIC-WEED. Common S., nat. from South America: 1° – 5° high, with 4 – 6 pairs of lance-ovate acute leaflets, a globular gland on the base of the petiole, and narrow linear smooth pods 5′ long. ①

C. obtusifòlia. From Illinois and Virginia S.; with 2 or 3 pairs of obovate leaflets, a pointed gland between the lowest, the pale flowers in pairs, and slender curved pods 6′ – 10′ long. ①

§ 2. *Low and spreading, smooth or roughish hairy herbs, in sandy or dry barren soil, with persistent striate stipules, and* 10 – 20 *pairs of small linear-oblong oblique or unequal-sided leaflets, which are somewhat sensitive, closing when roughly brushed; a cup-shaped gland below the lowest pair: flowers clustered in the axils.*

C. Chamæcrísta, LARGE-FL. SENSITIVE or PARTRIDGE PEA. Flowers pretty large, showy, on slender pedicels, with the petals often purple-spotted at base, a slender style, and 10 unequal stamens, some of the anthers usually yellow and others purple. Like the next most common S. ①

C. níctitans, SMALL-FL. S. Flowers small, on very short pedicels, with a short style, and 5 nearly equal anthers.

52. CÆSALPÍNIA. (Named for the early Italian botanist *Cæsalpinus.*) One species of tropical America, cult. in some conservatories, is planted out in Gulf States, viz.

C. pulchérrima (also named POINCIÀNA PULCHERRIMA), BARBADOES FLOWER-FENCE. Small tree, prickly, with twice-pinnate leaves, numerous oblong leaflets notched at the end, and open terminal racemes of large and showy flowers, the short-clawed broad and jagged-edged petals 1′ long and reddish-orange, and the crimson filaments 3′ long.

53. GYMNÓCLADUS, KENTUCKY COFFEE-TREE. (Name from Greek words for *naked branch*, the branches being very stout, and when the leaves have fallen appearing destitute of spray.)

G. Canadénsis. The only species, a fine ornamental and timber tree, wild from W. New York S. and especially W., with rough bark, twice-pinnate leaves 2° or 3° long, each partial leafstalk bearing 7 – 13 ovate and stalked leaflets, except the lowest pair, which are single leaflets (2′ – 3′ long); the leaflets

remarkable for hanging edgewise. Flowers in early summer; ripening in late autumn, the large and indurated pod 5′ – 10′ long and 1½′ – 2′ wide; the seeds over ½′ across.

54. GLEDÍTSCHIA, HONEY-LOCUST. (Named for the early German botanist, *Gleditsch.*) Fl. early summer, inconspicuous, ripening the pods late in autumn. Thorns simple or compound; those on the branchlets above the axils. Leaves on growing shoots of the season twice pinnate; those in clusters on spurs mostly once pinnate.

G. triacánthos, Three-thorned Acacia or Common H. Wild in rich soil from Penn. S. & W., also commonly planted for shade, sometimes used for hedges: a rather tall tree, with light foliage, large often very compound thorns flattish at the base and tapering, small lance-oblong leaflets, and linear flat pods 9′ – 20′ long, often twisted or curved. A var. inérmis has very few or no thorns.

G. Sinénsis, Chinese H., occasionally planted, has stouter conical thorns, and broader oval leaflets.

G. monospérma, One-seeded or Water H. Swamps from Illinois S. W.: small tree, with slender thorns, ovate or oblong leaflets, and oval 1-seeded pods, containing no pulp.

55. MIMÒSA, SENSITIVE-PLANT. (From Greek word *to mimic*, i. e. the movements imitating an animal faculty.) There are wild shrubby species in Texas and farther S. The following are herbs, procumbent or trailing, with bristly short pods.

M. pudìca, Common S. Beset with spreading bristly hairs and somewhat prickly; the leaves very sensitive to the touch, of very numerous linear leaflets on 2 pairs of branches of the common petiole, crowded on its apex, so as to appear digitate; flowers rose-purple, in slender-peduncled heads, in summer. Cult. from South America. ①

M. strigillòsa, Wild S. Rough with appressed stiff bristles, not prickly; leaves with 5 or 6 pairs of branches of the common petiole, each bearing 10 – 14 pairs of oblong-linear leaflets; flowers rose-color; oblong head on very long peduncle. Wild on river-banks far S.: fl. summer. ♃

56. SCHRÁNKIA, SENSITIVE-BRIER. (Named for a German botanist, *Schrank.*) Two species wild in dry sandy soil, S. & W., spreading on the ground, appearing much alike, with leaves closing like the Sensitive-Plant, but only under ruder handling: flowers rose-purple, small, in globular heads on axillary peduncles, in summer. ♃

S. uncinàta. Stems, petioles, peduncles, and oblong-linear short-pointed pods beset with rather stout hooked prickles; leaflets elliptical, reticulated with strong veins underneath.

S. angustàta. Prickles scattered, weaker, and less hooked; leaflets oblong-linear, not reticulated; pods slender, taper-pointed.

57. DESMÁNTHUS. (Greek-made name, meaning that the flowers are *bound together:* they are merely crowded in a head. A few species very far S., and the following W.

D. brachýlobus. Prairies from Illinois S. & W.: nearly smooth, 1° – 4° high, erect, with 6 – 15 pairs of partial petioles, each bearing 20 – 30 pairs of very small narrow leaflets, one or more glands on the main petiole, small heads of whitish flowers, followed by short 2 – 6-seeded pods; stamens 5. ♃

58. ALBÍZZIA, SILK-FLOWER. (Named for an Italian botanist.)

A. Julibríssin, Silk-Flower or Silk-Tree, from Asia, planted for ornament S.: a small tree, with leaves of numerous pairs of partial petioles, each bearing about 60 oblong acute leaflets, which appear as if halved, and with panicled heads of rather large pale rose-purple flowers, the long and lustrous filaments, like silky threads in tufts (giving the popular name), being mainly conspicuous; pod 5′ – 6′ long, oblong-linear, very flat and thin.

59. ACÀCIA. (Ancient Greek and Latin name of Acacia-trees; one species yields Gum Arabic.) No native species north of Texas. The following are exotic shrubs or trees, cult. in conservatories N., and one of them planted or run wild far S.

§ 1. *Leaves twice pinnate, of very numerous small leaflets.*

A. Farnesiàna. Native of South America: nat. along the Gulf of Mexico, sometimes cult.: a nearly smooth shrub, with pairs of short prickles along the branches, small linear leaflets, small heads, on short peduncles (2 or 3 together) of yellow very sweet-scented flowers, used by the perfumers. The plant also yields gum. Pod thick, pulpy or pithy within.

A. dealbàta, of Australia: a fast-growing small tree, not prickly nor thorny, pale or whitened with minute obscure down or mealiness; with leaves of 10 – 25 pairs of partial petioles (a little gland on the main petiole between each pair), and very many pairs of closely set and minute linear leaflets; the bright yellow flowers in globular heads collected in an ample very open raceme or panicle, odorous.

§ 2. *Only the leaves of the seedling twice-pinnate; the rest simple and entire mostly blade-like petioles (called phyllodia,* Lessons, p. 61), *standing edgewise instead of flatwise, but otherwise imitating rigid simple leaves. Chiefly natives of Australia, where they are extremely numerous.*

* *Leaves short, and with only a central nerve or midrib,*

– *Linear awl-shaped or almost needle-shaped, prickly-tipped, small, about* ½′ *long.*

A. juniperìna. Rigid bushy shrub, with the leaves scattered over the branches, and flowers in single small round heads.

A. verticillàta. Spreading shrub or low tree, with the leaves crowded more or less in whorls of 5 – 8 or more, and flowers in cylindrical spikes.

– – *Obliquely oblong, lanceolate, or broader, not prickly-tipped.*

A. armàta. Tall-growing shrub, usually with hairy branches, and with conspicuous prickle-like stipules; half-ovate oblong or incurved-lanceolate leaves mostly blunt, with somewhat wavy margins, feather-veined, not over 1′ long; flowers in round heads.

A. vestita. Tall-growing shrub, soft-downy, with drooping branches, pale obliquely wedge-ovate or obovate and curved bristle-pointed leaves, and small globular heads of flowers in racemes.

A. cultrifórmis. Shrub smooth, mealy-glaucous when young, with triangular or lance-obovate and curved minutely pointed leaves, of thick and firm texture, and globular heads in racemes, forming a leafy terminal panicle.

* * *Leaves* 3′ – 6′ *or more long, pointless, with* 2 – 5 *parallel nerves, or when very narrow only* 1*-nerved: flowers in slender loose or interrupted axillary spikes.*

A. longifòlia. Shrub or small tree, smooth, with angular branches, and leaves varying from lance-oblong to linear, greatly varying, 2 – 5-nerved, often faintly veiny between the nerves.

A. lineàris. Like the preceding, but with leaves (4′ – 10′ long) very narrow-linear and with only one obvious nerve.

38. ROSACEÆ, ROSE FAMILY.

Plants with alternate stipulate leaves and regular flowers, with usually indefinite unconnected stamens inserted on the calyx, one, few, or many simple separate pistils (except in the division to which the Pear belongs), and single, few, or occasionally numerous seeds; these filled with a straight embryo. Destitute of noxious qualities (excepting the bark, leaves, and kernels of some Cherries, and the like), and furnishing the most important fruits of temperate climates, as well as the queen of flowers. We have three principal great divisions.

I. ALMOND or PLUM FAMILY: consists of trees or shrubs, with simple leaves, stipules free from the petiole (often minute or early deciduous, so that there may appear to be none), a calyx which is deciduous after flowering, and a single pistil, its ovary tipped with a slender style (Lessons, p. 103, fig. 213), containing a pair of ovules, and becoming a simple drupe or stone fruit. (Lessons, p. 120, fig. 375.)

1. PRUNUS. Calyx with a bell-shaped or urn-shaped tube and 5 spreading lobes. Petals 5, and stamens 3–5 times as many, or indefinitely numerous, inserted on the throat of the calyx. Flowers white or rose-color.

II. ROSE FAMILY PROPER: consists of herbs or shrubs, with stipules either free from or united with the base of the petiole, calyx persisting below or around the fruit, which is composed of sometimes one but commonly several or many distinct pistils.

§ 1. *Calyx not with a fleshy tube or cup, nor closed over the fruit.*

* *Ovaries about* 5 (2–12), *becoming little pods, several-*(2–10-)*seeded: calyx with only* 5 *or rarely* 4 *lobes.*

2. SPIRÆA. Shrubs or perennial herbs, with stipules sometimes minute or obsolete, sometimes conspicuous, and white or rose-purple flowers. Calyx open and short, mostly 5-cleft, not enclosing the pods. Petals equal, commonly broad. Stamens 10–50.

3. GILLENIA. Herbs, with nearly white flowers and almost sessile leaves of 3 leaflets. Calyx narrow, oblong, 5-toothed, enclosing the 5 pistils (which at first lightly cohere in a mass) and the little pods. Petals rather unequal, lance-linear. Stamens 10–20, not projecting.

* * *Ovaries few or many, single-ovuled, becoming dry akenes in fruit above the open and mostly spreading calyx: stamens numerous.*

+– *Pistils few, only* 2–8.

4. KERRIA. Shrub, with long green branches, simple and coarsely-toothed leaves, and yellow flowers terminating the branchlets of the season. Calyx with 5 somewhat toothed large lobes. Petals broad.

5. WALDSTEINIA. Low perennial herbs, with chiefly root-leaves, either lobed or compound, and a few yellow flowers on a short scape. Calyx with a top-shaped tube and 5 spreading lobes, alternate with which are sometimes 5 minute teeth or bractlets. Petals obovate. Styles deciduous by a joint.

+– +– *Pistils numerous and heaped in a head: calyx* (*except in one* Geum) *augmented with additional outer lobes or bractlets alternating with the* 5 *proper lobes: leaves mostly compound.*

6. GEUM. Perennial herbs. Calyx with a bell-shaped, top-shaped, or hemispherical tube or cup. Akenes narrow, or tapering to the base, tipped with the long persistent style, or the greater portion of it, in the form of a naked or hairy tail. Seed erect. Receptacle dry, conical or cylindrical.

7. POTENTILLA. Herbs, or one species shrubby. Calyx flat or widely open Akenes small, on a dry receptacle, from which they at length fall.

8. FRAGARIA. Perennial low or stemless herbs, with runners; and leaves of 3 leaflets. Calyx open, flat. Styles short and lateral. Akenes naked, small, on the surface of an enlarged pulpy edible receptacle. (Lessons, p. 113, fig. 360, and p. 118, fig. 368.)

* * * *Ovaries several or many,* 2-*ovuled, in fruit becoming fleshy or pulpy and* 1-*seeded, forming a head or cluster above the flat or widely open simply* 5-*cleft calyx: stamens numerous: styles short, naked, at length falling off.*

9. DALIBARDA. Very low perennial tufted herb, with simple rounded-heart-shaped or kidney-shaped root-leaves and 1–2-flowered scapes. Calyx of 5 or even 6 unequal sepals. Ovaries 5–10, in fruit merely fleshy, becoming almost dry and bony.

10. RUBUS. Perennial herbs or shrubby plants. Ovaries numerous, in fruit pulpy (berry-like, or more properly drupe-like, the inner hard part answering to the stone of a cherry or peach on a small scale), crowded on the dry or fleshy receptacle. (Lessons, p. 118, fig. 369, 370.)

§ 2. *Calyx with an urn-shaped dry tube, contracted or nearly closed at the mouth, and enclosing* 1 – 4 *little pistils which become akenes. Flowers small: petals none except in* Agrimonia.

11. ALCHEMILLA. Low herbs, with palmately lobed or compound leaves, and minute greenish flowers in clusters or corymbs. Calyx with 4 inner and 4 outer or accessory spreading lobes. Petals none. Stamens 1 – 4. Pistils 1 – 4, with lateral styles.
12. AGRIMONIA. Herbs, with interruptedly pinnate leaves, and flowers in slender terminal spikes or racemes. Calyx with the top-shaped tube beset with hooked bristles just below the 5 green lobes, the latter closing together in fruit. Petals 5, commonly yellow, broad and spreading. Stamens 5 – 15. Pistils 2: styles terminal.
13. POTERIUM. Herbs, with odd-pinnate leaves, and white, purple, or greenish flowers (sometimes diœcious) in dense heads or spikes on long erect peduncles. Calyx with a short 4-angled closed tube, surmounted by 4 broad and petal-like at length deciduous lobes. Petals none. Stamens 4 – 12 or more, with long and slender projecting filaments. Pistils 1 – 4: the terminal styles tipped with a brush-like or tufted stigma.

§ 3. *Calyx with an urn-shaped or globose fleshy tube, contracted at the mouth, enclosing the many pistils and akenes. Flowers large and showy.*

14. ROSA. Shrubby, mostly prickly, with pinnate leaves, of 3 – 9 or rarely more serrate leaflets, stipules united with the base of the petiole, and flowers single or in corymbs terminating leafy branches. Calyx with 5 sometimes leafy lobes which are often unequal and some of them toothed or pinnately lobed. Petals 5, or more in cultivation, broad, inserted along with the many stamens at the mouth of the calyx-tube. Pistils numerous, with terminal styles, and one-ovuled ovaries, becoming hard or bony akenes, enclosed in the tube or cup of the calyx, which in fruit becomes pulpy and imitates a berry or pome. (Lessons, p. 113, fig. 361.)

III. PEAR FAMILY: consists of shrubs or trees, with stipules free from the petiole (often minute or early deciduous); the thick-walled calyx-tube becoming fleshy or pulpy and consolidated with the 2 – 5 ovaries to form a compound pistil and the kind of fruit called a pome. (Lessons, p. 119, fig. 374.) Lobes of the calyx and petals 5. Stamens numerous, or rarely only 10 – 15.

* *Fruit drupe-like; the seeds solitary in a hard stone or stones.*

15. CRATÆGUS. Trees or shrubs, mostly with thorny branches and flowers in corymbs or cymes, or sometimes solitary, terminating the branchlets; the leaves lobed or serrate. Styles 2 – 5 (or rarely 1): ovary of as many 2-ovuled cells. Fruit with a stone of 2 – 5 (rarely single) 1-seeded cells or carpels, more or less cohering with each other.
16. COTONEASTER. Shrubs (exotic), usually low, with the small coriaceous leaves entire and whitish-downy underneath, small clustered flowers, and the calyx white-woolly outside. Styles 2 – 5. Fruit small, the pulpy calyx-tube containing 2 – 5 little seed-like hard stones.

* * *Fruit with thin and cartilaginous or papery* 2 – *several-seeded carpels in the pome.*

+ *Leaves persistent.*

17. PHOTINIA. Trees or shrubs (exotic), not thorny, with ample evergreen leaves. Flowers corymbed. Styles 2 – 5, dilated at the apex. Fruit berry-like, the 2 – 5 partitions thin, or vanishing.

+ + *Leaves deciduous.*

18. AMELANCHIER. Trees or shrubs, not thorny, with simple leaves, racemed flowers, and narrow white petals. Styles 5, united below. Ovary of 5 two-ovuled cells, but each cell soon divided more or less by a projection or growth from its back, making the berry-like fruit 10-celled.
19. PYRUS. Trees or shrubs, sometimes rather thorny, with various foliage, and flowers in cymes, corymbs, or rarely solitary. Styles 2 – 5. Ovary of 2 – 5 two-ovuled (or in cultivated species several-ovuled) cells, which are thin and papery or cartilaginous in fruit in the fleshy or pulpy calyx-tube.
20. CYDONIA. Trees or shrubs, with entire or merely serrate leaves, and rather large flowers, which resemble those of Pyrus, as does the fruit, only the 5 cells are many-ovuled and many-seeded.

1. PRŪNUS, PLUM, &c. (The ancient Latin name of the Plum.) As now received, this genus comprises all the following groups, which it has been found impracticable to keep up as botanical genera. Foliage and the stone and kernel of the fruit usually with the flavor of prussic acid, especially in the Peach and Cherries.

§ 1. ALMOND and PEACH. *Flowers almost sessile, from separate scaly buds, in spring, before the leaves, the latter folded together lengthwise (conduplicate) in the bud: fruit velvety, large: the stone with wrinkles and holes.*

P. (Amýgdalus) nàna, DWARF or FLOWERING ALMOND. Cult. for ornament, from Asia; a low shrub, with abundant and handsome rose-colored (or by variation white) usually full-double flowers, earlier than the long and narrow smooth leaves; calyx-tube short-cylindrical; fruit dry when ripe, with the outer part separating as a husk from the brittle stone, as in the edible Almond.

P. (A.) Pérsica, PEACH. Cult. from Asia for the fruit, also a double-fl. variety, for ornament; small tree, with purplish-rose-colored flowers, bell-shaped calyx-tube, lanceolate leaves, and globular fruit ripening a thick pulp, either clinging to or separable from the rough-wrinkled porous stone. Unknown in a wild state, probably derived from the COMMON ALMOND, P. (A.) COMMŪNIS. — Var. **lævis,** the NECTARINE, is a state with a smooth-skinned fruit.

§ 2. APRICOT. *Flowers short-pedicelled or almost sessile, from separate scaly buds, in early spring, before the leaves, which are rolled up (convolute) in the bud: drupe velvety, but with a smooth stone having grooved margins, one of them sharp-edged.*

P. Armeniaca, APRICOT. Cult. from Armenia; a low smooth tree, with ovate and mostly rather heart-shaped leaves, white or slightly rosy flowers solitary or in pairs, and early-ripening fruit, of character intermediate between peach and plum.

§ 3. PLUM and CHERRY. *Flowers pedicelled and almost always white: drupe smooth, its stone smooth or somewhat rugged.*

* PLUMS. *Flowers from separate lateral buds, in spring, preceding or coetaneous with the leaves; the latter rolled up, or in most of our native species folded together, in the bud: drupe generally with a whitish bloom and a flat or flattish stone.*

† *Exotic (European or Asiatic) species.*

P. doméstica, GARDEN PLUM, of many varieties: tree with spreading thornless branches, and oblong or lance-ovate leaves; the fruit very various in size and shape, with a flat or flattish and roughish stone. Doubtless (at least in part) a long-cultivated derivative of

P. insitítia, BULLACE PLUM, introduced in some places near the seaboard, has been used as a stock for grafting, &c., is a little thorny, the pedicels and lower face of the leaves downy, the fruit round and black.

P. spinòsa, SLOE, or BLACK THORN. Cult. or nat. in old gardens or waste places: a low tree, with spreading thorny branches; the obovate-oblong or lance-oblong leaves and pedicels soon glabrous; fruit small, globular, purple-black, with a turgid stone and a greenish astringent pulp. Probably this is the original of the Bullace.

†† *Native species of the country, but two of them have been planted for the fruit. They are manifestly Plums rather than Cherries, although the last is ambiguous as to the fruit, only the Beach Plum has an obvious bloom on the fruit, and all have the leaves folded in the bud.*

P. marítima, BEACH PLUM. Sea-beaches and sandy soil near the coast; a scarcely thorny shrub, 2°–5° high, with the ovate or oval finely serrate leaves soft-downy underneath, short and downy pedicels, and globular purple or crimson fruit with a bloom ($\frac{1}{2}'$ – $1'$ long), rather pleasant-tasted, sometimes used for preserving.

P. Americàna, WILD RED and YELLOW PLUM. Along streams through the country; occasionally planted; a tall shrub or small tree, often thorny,

with the oval or obovate and pointed leaves thin, very veiny, coarsely or doubly serrate, smooth when old; the globular or oval fruit ($\frac{1}{2}'-\frac{3}{4}'$ in diameter) yellow with some red, orange, or crimson, with a pleasant juice but a tough acerb skin, the stone sharp-edged or margined.

P. Chicàsa, Chickasaw Plum. Planted or run wild from Penn. S. & W., native S. W., 6°–12° high, somewhat thorny, with long and narrow almost lanceolate acute leaves, edged with very fine teeth, a globular red fruit ($\frac{1}{2}'-\frac{3}{4}'$ in diameter) of pleasant flavor, thin-skinned, and containing a marginless almost globular stone.

* * Cherries *of the Garden-Cherry sort, i. e. with flowers in sessile umbels from separate lateral buds, in spring, with or rather preceding the leaves, which are folded together lengthwise in the bud.*

P. Cérasus, Garden Red Cherry. Cult. from Eu.; a tree 10°–30° high, with slender spreading branches, obovate and lance-ovate serrate leaves, rather large flowers on shortish pedicels and somewhat preceding the leaves, and an acid red globose fruit. The Morello Cherry is a variety with dark purple more astringent fruit. Probably derived from, or now sometimes mixed with the next.

P. àvium, Bird Cherry of Eu., English Cherry. Cult. from E.; making a larger tree than the preceding, with ascending branches, softer and coarsely or doubly toothed more pointed leaves, usually pubescent beneath, the flowers developed at the same time with the leaves, and the round-ovoid or somewhat heart-shaped fruit sweet or bitterish-sweet (not acid), of various colors. Double-flowered varieties are cult. for ornament.

P. Pennsylvànica, Wild Red Cherry. Rocky woods N. Small tree, with light red-brown bark, oblong-lanceolate and pointed leaves smooth and green both sides, their margins finely and sharply serrate, small flowers on long pedicels, and light red sour fruit not larger than peas.

P. pùmila, Dwarf Cherry. Rocks or sandy banks N. Shrub spreading or forming broad tufts on the ground, seldom rising 2°; leaves spatulate-lanceolate, pale beneath, toothed only towards the apex; flowers 2–4 together; fruit ovoid, dark red, with stone as large as a pea.

* * * Cherries *of small size, with flowers in racemes,*

+ *In late spring or early summer, terminating leafy shoots of the season.*

P. serótina, Wild Black Cherry. Tree or shrub, westward becoming a good-sized forest tree, with bitter aromatic bark, close-grained reddish wood valued by the cabinet-maker; the oblong or lance-oblong smooth leaves of thickish or firm texture, usually taper-pointed, serrate with incurved short callous teeth; flowers in long racemes, considerably later than the next; purplish-black bitterish vinous fruit ripening in autumn.

P. Virginiàna, Choke Cherry. Tall shrub or small tree, with grayish bark, oval-oblong or obovate and abruptly pointed thin leaves very sharply serrate with slender projecting teeth; flowers in shorter and closer racemes, in spring; the fruit ripe in summer, red turning dark crimson, astringent, but eatable when fully ripe, the stone smooth.

P. Pàdus, Small Bird-Cherry of Eu., is occasionally planted; resembles the last, has longer and looser often drooping racemes, and a roughened stone.

+ + *Erect racemes in early spring, from the axils of evergreen leaves.*

P. Caroliniàna, Carolina Laurel-Cherry, also called Mock Orange at the South, probably from the coriaceous smooth and glossy leaves, which are lance-ovate or oblong, entire or with a few sharp and appressed teeth, longer than the racemes, the calyx as well as petals white; small fruit black and bitter, becoming dry. Ornamental small tree; the leaves said to be poisonous to cattle.

P. Lauro-Cérasus, Laurel-Cherry of Europe, from Asia Minor, and **P. Lusitànica,** Portugal L., from Portugal and the Azores, beautiful evergreen shrubs or small trees, used for hedges and screens in England, are not hardy N., but would stand south of Penn. Their leaves and kernels are strongly imbued with the prussic-acid or bitter-almond flavor.

2. SPIRÆA, MEADOW-SWEET, &c. (Greek name of some shrub, of the flowering branches of which garlands were made.) All hardy shrubs or perennial herbs: fl. late spring and summer.)

§ 1. *Shrubs, with simple leaves.*

* *Native species: but the last common in gardens, the first occasionally planted.*

S. opulifòlia, NINE-BARK; so-called from the loose bark, separating in thin annual layers from the stems: a tall shrub, with long recurving branches, the roundish and mostly heart-shaped leaves partly 3-lobed and cut-toothed, white flowers (of no beauty) in umbel-like corymbs, the pods large for this genus, bladdery, and commonly turning purplish. Wild on rocky banks, from New York W. & S.

S. corymbòsa. From S. Penn. S., not common: shrub 1° – 2° high, smooth, with oval leaves cut-toothed towards the apex, and white flowers in a flat compound corymb.

S. tomentòsa, HARDHACK or STEEPLEBUSH. Common E. in low grounds; 2° – 3° high, hoary-downy, except the upper face of the ovate or oblong serrate small leaves, the rose-purple or white flowers crowded in a very dense terminal panicle; pistils downy.

S. salicifòlia, COMMON MEADOW-SWEET. Common in wet grounds, also in old gardens: shrub 2° – 3° high, bushy, smooth, with wedge-lanceolate or oblong leaves simply or doubly serrate, and white or barely flesh-colored flowers in a crowded panicle.

* * *Cultivated for ornament, exotic or W. North American.*

+– *Flowers in close or spike-like clusters collected in a close and narrow or spike-like terminal panicle, pink-purple.*

S. Douglàsii, DOUGLAS'S MEADOW-SWEET. Cult. from Oregon and California: resembles our wild Hardhack (S. tomentosa), but has longer usually lance-oblong and very blunt leaves rather whiter beneath, and deeper pink flowers with smooth pistils.

+– +– *Flowers in compound corymbs or broad panicles.*

S. callòsa (also named S. FORTÙNEI), from Japan: shrub 3° – 6° high, smoothish, with lance-oblong and taper-pointed unequally and very sharply serrate leaves, branches terminated by clustered dense corymbs or cymes of deep pink flowers, 10 glands at the mouth of the calyx, the pistils smooth.

S. ariæfòlia. Tall shrub from Oregon, with slender branches, terminated by a very large and light or drooping decompound panicle of small yellowish-white flowers; the leaves roundish-ovate, very obtuse, thin, cut on each side into 4 or 5 blunt and toothed lobes, sometimes almost pinnatifid, soft downy, at least beneath.

+– +– +– *Flowers in simple, often umbel-like corymbs terminating leafy shoots of the season: natives of Europe and Asia: petals white except the first species.*

S. bélla, from Nepal: a low shrub, with ovate acute and merely sharply serrate leaves whitish-downy beneath, the simple corymbs sometimes clustered, and rose-pink flowers.

S. chamædrifòlia, from E. Europe and Siberia; a spreading low bush, smooth, with ovate or oblong usually blunt and cut-toothed leaves, at least towards the summit, and rather small flowers in simple corymbs.

S. trilobàta, from Siberia; a spreading smooth bush, with rounded crenately cut and 3-lobed leaves and rather showy flowers.

S. lanceolàta, or REEVESIÀNA, from China, has oblong, lance-oblong, or some three-cleft serrate-toothed leaves, and showy flowers.

S. hypericifòlia, ITALIAN MAY, or ST. PETER'S WREATH. Shrub 3° – 6° high, smooth or smoothish, with long recurved branches, and very small wedge-oblong leaves, a little crenate or lobed at the end; flowers small, white, in small sessile umbels.

+– +– +– +– *Flowers in simple sessile umbels along the slender branches of the preceding year, subtended only by greenish bud-scales or imperfect leaves, rather earlier than the proper leaves, in spring.*

S. prunifòlia, from Japan: slender shrub, with small ovate finely and sharply serrate leaves, smooth above, often minutely downy beneath; the form cultivated has full-double pure white blossoms, ½′ in diameter, produced in great abundance.

§ 2. *Shrubby, with pinnate leaves.*

S. sorbifòlia. Cult. from Siberia, very hardy, 3° – 4° high, with leaves (as the name denotes) resembling those of the Mountain-Ash, of 17 - 21 lanceolate taper-pointed doubly and sharply serrate leaflets, and white flowers in an ample terminal panicle, the narrow pods a little cohering.

§ 3. *Herbs, with thrice pinnately-compound leaves, no stipules, and diœcious flowers.*

S. Arúncus, Goatsbeard. Rich woods from New York S. & W., also in some gardens: smooth, 3° – 5° high; with lance-oblong or lance-ovate taper-pointed leaflets sharply serrate and cut, and yellowish-white very small flowers in great numbers, crowded in slender spikes which are collected in a great compound panicle; petals narrow; pedicels reflexed in fruit.

§ 4. *Herbs, with interruptedly pinnate leaves, conspicuous stipules, perfect flowers, reflexed sepals and petals sometimes* 4, *and* 5 – 12 *little* 1 – 3-*seeded pods.*

S. Filipéndula, Dropwort. Cult. from Europe: some of the coarse long fibrous roots swollen at the lower end into oblong tubers; herbage smooth and green; leaves chiefly from or near the ground, with many oval or lanceolate leaflets deeply toothed, cut, or pinnately cleft, and gradually diminishing in size downwards; the nearly naked stems 1° – 2° high, bearing a compound terminal cyme of white or rosy-tipped flowers, one variety full-double.

S. Ulmària, English Meadow-Sweet. Cult. from Europe; 1° – 3° high, nearly smooth, except the lower surface of the lyrate and interruptedly pinnate leaves which is minutely white-downy; the yellowish-white small and sweet-scented flowers very numerous and crowded in a compound cyme at the naked summit of the stems; little pods twisting spirally.

S. lobàta, Queen-of-the-Prairie. Wild in meadows and prairies W., also cult.: smooth and green; the leaves mostly from or near the ground; the end leaflet very large, 7 – 9-parted, and its lobes cut-toothed; stems 2° – 5° or even 8° high, bearing an ample and panicled compound cyme crowded with the handsome peach-blossom-colored flowers. Bruised foliage exhales the odor of Sweet Birch.

3. GILLÈNIA, INDIAN PHYSIC, AMERICAN IPECAC. (Named for a *Dr. Gillen* or *Gillenius.*) Fl. summer. ♃

G. trifoliàta, Common I. or Bowman's-Root. Rich woods, from New York S. & W.; smooth, branching, 2° high, with the 3 ovate-oblong pointed leaflets cut-toothed, entire stipules small and slender, and rather pretty white or scarcely rosy-tinged flowers loosely panicled on the slender branches.

G. stipulàcea, Large-stipuled I. or American Ipecac. Open woods, W.: has the lanceolate leaflets and leaf-like stipules deeply cut and toothed: otherwise like the other.

4. KÉRRIA. (Named for *Bellenden Ker,* a British botanist.)

K. Japónica, Corchorus, so-called, of the gardens, from Japan: a familiar, smooth, ornamental shrubby plant, 4° – 8° high, with lance-ovate thin leaves, and handsome yellow flowers, in summer, usually full-double; — the natural state, with 5 petals and numerous stamens only recently introduced and rare.

5. WALDSTEÌNIA. (Named for *F. von Waldstein,* an Austrian botanist.)

W. fragarioìdes, Barren Strawberry. Wooded banks, chiefly N.; in aspect and especially in the 3 broadly wedge-shaped leaflets resembles a Strawberry-plant (as the specific and the popular names denote), but is smoothish and yellow-flowered: in summer. ♃

6. GÈUM, AVENS. (From Greek word, meaning to give an agreeable flavor; the roots of some species somewhat scented.) Several wild species, only the following common: fl. late spring and summer. 2

G. rivàle, PURPLE or WATER AVENS. In bogs and low grounds N.: thickish rootstock (sometimes used in medicine as an astringent) sending up lyrately and interruptedly pinnate leaves, and rather naked several-flowered stems (2° high); the flowers pretty large, nodding, with purplish-orange and broadly obovate or obcordate petals narrowed at the base, never spreading; in fruit the head of akenes erect, stalked in the persistent calyx, the persistent styles jointed and bent in the middle, the upper part plumose-hairy.

G. vérnum, SPRING A. Thickets, from Ohio to Illinois and Kentucky: slender, 2° – 3° high; root-leaves rounded heart-shaped and 3 – 5-lobed, or some of them pinnate and cut; flowers small, with yellow petals about the length of the simply 5-lobed calyx; the head of fruit raised above the calyx on a conspicuous stalk; the styles, &c. smooth, the upper joint falling off.

G. stríctum, FIELD A. Moist grounds and fields: a coarse herb, 3° – 5° high, rather hairy, with root-leaves interruptedly pinnate and the leaflets wedge-obovate, those of the stem with 3 – 5 narrower leaflets; in summer bearing panicled flowers with broadly obovate golden-yellow petals exceeding the calyx; stipules large, deeply cut; head of fruit close in the calyx; the persistent naked style hooked at the end after the short upper joint falls; receptacle downy.

G. Virginiànum, WHITE A. Thickets and border of woods: coarse and bristly-hairy herb 1° – 3° high, with root and lower leaves of several pinnate leaflets, the upper 3-parted and cut; the panicled flowers small, with inconspicuous greenish-white petals shorter than the calyx; head of fruit like the last, but its receptacle smooth.

G. álbum, WHITE A. Grows in similar places with the preceding, and like it, but smooth or soft-pubescent, with root-leaves of 3 – 5 leaflets, or some of them rounded and simple except a few minute leaflets below; the petals as long as the calyx, white or pale greenish-yellow; receptacle of fruit bristly.

7. POTENTÍLLA, CINQUEFOIL, FIVE-FINGER. (Name from *potens*, powerful, from reputed medicinal virtues, but these plants are merely mild astringents.) Wild plants of the country, except those of the last section, and one yellow one: but the *Shrubby Cinquefoil* is also planted.

§ 1. *Petals pale yellow, small, not surpassing the calyx.* ① ②

P. Norvègica, NORWAY C. An erect, hairy, weedy plant, 1° – 2° high, branching above, with only 3 obovate-oblong and cut-toothed leaflets: fl. summer, in fields.

P. paradóxa. A spreading or procumbent, pubescent, weedy plant, on river-banks W., with pinnate leaves of 5 – 9 obovate-oblong cut-toothed leaflets, and akenes with a thick appendage at their base: fl. summer.

§ 2. *Petals whitish or cream-color, broad, surpassing the calyx: akenes smooth.* 2

P. argùta. A stout, erect, brownish-hairy, coarse plant, 1° – 4° high, rather clammy above, on rocky hills N. & W., with pinnate leaves of 3 – 9 oval or ovate cut-toothed leaflets soft-downy beneath, and a close terminal cluster of rather large flowers, of no beauty, in summer.

§ 3. *Petals bright yellow, larger than the lobes of the calyx.* 2

* *Leaves of 5 digitate leaflets.*

P. récta. Cult. in some old gardens, from Eu.: a coarse, erect, hairy plant, 2° – 3° high, with sometimes 7 narrowly wedge-oblong leaflets coarsely toothed, and rather large cymose flowers.

P. Canadénsis, COMMON WILD C. or FIVE-FINGER. Open dry ground: dwarf, silky-hairy, with wedge-obovate leaflets, and axillary 1-flowered peduncles; flowering from early spring to midsummer, and spreading by runners.

Var. **símplex,** in moister or richer soil, usually well marked by its greater size and greener foliage; the stems 1° – 2° long, ascending or spreading from a short tuberous rootstock; leaflets more oblong; flowers produced through the summer.

P. argéntea, Silvery C. Dry fields, banks, and roadsides N.: a low, spreading or prostrate, much branched, white-woolly weed, with wedge-oblong cut-pinnatifid leaflets green above, white with silvery wool beneath, and the margins revolute; the small flowers somewhat panicled, all summer.

* * *Leaves pinnate: receptacle and partly the akenes white-hairy.*

P. Anserina, Silver-Weed. Wet banks and shores, N. & W.: leaves all from the root or in tufts on the long slender runners, green above, silvery with silky down beneath, of 9–19 oblong cut-toothed principal leaflets and some pairs of minute ones intermixed; stipules conspicuous and many-cleft; flowers solitary on long scape-like peduncles, all summer.

P. fruticòsa, Shrubby C. Wet grounds N.: 2°–4° high, woody, silky, very much branched, with 5 or 7 crowded oblong-lanceolate entire leaflets, scale-like stipules, and loose clusters of rather showy flowers, all summer.

§ 4. *Petals white: akenes and receptacle hairy: leaflets only* 3, *digitate.* 2

P. tridentàta, Three-toothed C. Coast of N. England N. and on mountains: 4′–6′ high, tufted, spreading, with 3 thickish nearly smooth leaflets coarsely 3-toothed at the end, and several flowers in a cyme, in early summer.

§ 5. *Petals purple, rose-color, or crimson: akenes smooth.* 2

* *Wild in wet and cold bogs N.: petals narrow, shorter than the calyx.*

P. palústris, Marsh Five-finger. Stems ascending from an almost woody creeping base; leaves pinnate, of 5–7 lance-oblong serrate and crowded leaflets, whitish beneath; flowers in a small cyme, the calyx nearly 1′ broad, the inside as well as the petals dull dark purple; receptacle becoming large and spongy: fl. all summer.

* * *From Himalaya, cult. for ornament: petals broad and large, obcordate.*

P. Nepalénsis, Nepal C. Leaflets 3 in the upper, 5 in the lowest leaves, digitate, hairy but green both sides, wedge-oblong, coarsely toothed; flowers rose-red, all summer. P. Hopwoodiàna, with flesh-colored flowers, is a garden hybrid of this and P. recta.

P. atrosanguínea, Dark Nepal C., is soft silky-hairy, with 3 leaflets to all the leaves, and much darker-colored flowers than in the preceding, brown-purple or crimson.

8. FRAGÀRIA, STRAWBERRY. (Name from *fraga*, the old Latin name of the strawberry.) 2

§ 1. True Strawberries. *Petals white: receptacle of the fruit high-flavored: scapes several-flowered: runners naked. Fl. in spring and early summer, those of all but the first species inclined more or less to be diœcious. In cultivation the species are considerably mixed by crossing.*

F. vésca, Common S. of Europe, yields the Alpine, Perpetual, &c., plentifully native N.; is mostly slender, with thin dull leaflets strongly marked by the veins, calyx remaining open or reflexed after flowering, small ovoid-conical or elongated fruit high-scented, and the akenes superficial.

F. elàtior, Hautbois S., of Europe, sometimes cult.; is taller and quite diœcious, with the calyx strongly reflexed away from the fruit, which is dull reddish and musky-scented.

F. Virginiàna, Virginian Wild S., original of the American Scarlet, &c.; has leaflets of firm texture, their smooth and often shining upper surface with sunken veins, calyx becoming erect after flowering and closing over the hairy receptacle when unfructified; fruit with a narrow neck, mostly globular, its surface with deep pits in which the akenes are sunken.

Var. **Illinoénsis,** perhaps a distinct species, is coarser and larger, grows in richer soil, from W. New York W. & S., the hairs of the scape, &c. shaggy, is the supposed original of Hovey's Seedling, Boston Pine, &c.

F. Chilénsis, native of Pacific coast from Oregon S.; its varieties and crosses with the foregoing have given rise to the Pine-apple S. and the like: a large and robust species, with very firm and thick leaflets soft-silky beneath or on both faces, and a hairy receptacle, the large rose-colored fruit erect in the pure state (instead of hanging), ripening late.

§ 2. *Petals yellow: receptacle tasteless: runners bearing leaves and 1-flowered peduncles: calyx with 5 external pieces very large, leaf-like, and 3-lobed.*

F. Índica, INDIAN S., of Upper India, &c.: cult., running wild S. E., rather handsome both in flower and (red) fruit, which are produced all summer and autumn.

9. DALIBÁRDA. (Named for *Dalibard,* an early botanist of Paris.) 2

D. rèpens, of wooded slopes N., is a low, stemless, tufted, downy little plant, spreading more or less by subterranean runners, with the aspect of a Violet, the scapes bearing one or two delicate white flowers, in summer.

10. RÙBUS, BRAMBLE, &c. (The Roman name, connected with *ruber,* red.) 2

§ 1. FLOWERING RASPBERRIES, *with simple leaves and broad flattish fruit, the very small and numerous reddish or amber-colored grains at length separating from the persistent receptacle.*

R. odoràtus, PURPLE F. Dells, &c., N.: shrubby, 3° – 5° high, clammy-bristly and odorous, not prickly; with ample 3 – 5-lobed leaves, the lobes pointed and the middle one longest, peduncles many-flowered, calyx-lobes with long slender tips, and petals purple-rose-color; the showy flowers 1′ – 2′ across, produced all summer.

R. Nutkànus, WHITE F. From Upper Michigan to Pacific, and cult.: like the other, but less bristly and clammy, with leaves more equally 5-lobed and coarsely toothed, and fewer flowers with narrower white petals.

§ 2. TRUE RASPBERRIES, *with 3 – 5 leaflets, the fruit falling when ripe from the then dry narrow receptacle: flowers with small white erect petals, in early summer, on leafy shoots of the season which (in all but the first) spring from prickly more or less woody stems of the preceding year.*

R. triflòrus, DWARF RASPBERRY. Low woods N.; almost wholly herbaceous, slender, trailing, not prickly, with thin smooth leaves, of 3 rhombic-ovate acute leaflets, or the side-leaflets parted, making 5, all doubly serrate, peduncle bearing 1 – 3 small flowers, and the fruit of few grains.

R. occidentàlis, BLACK R. or THIMBLEBERRY. Borders of fields and thickets N., especially where ground has been burned over: glaucous-whitened, the long recurving stems, stalks, &c. armed with hooked prickles, but no bristles; leaflets mostly 3, ovate, pointed, white-downy beneath, coarsely doubly toothed, the lateral ones stalked; petals shorter than the sepals: fruit purple-black (or an amber-colored variety), flattish, ripe at midsummer.

R. Idæus, GARDEN R. Cult. from Eu. for the fruit: tall and nearly erect, beset with straight slender prickles or many of them mere bristles; leaves thicker, and fruit firmer and larger than in the next red or yellowish, ripening through the summer.

R. strigòsus, WILD RED R. Common especially N.: 2° – 3° high, the upright stems, stalks, &c. beset with copious bristles, and some of them becoming weak prickles, also glandular; leaflets oblong-ovate, pointed, cut-serrate, white-downy beneath, the lateral ones (either one or two pairs) not stalked; petals as long as the sepals; fruit light-red, tender and watery but high-flavored, ripening all summer.

§ 3. BLACKBERRIES, *with the pulpy grains of the fruit remaining attached to the pulpy receptacle, which at length falls away from the calyx: stems prickly: leaves of 3 or pedately 5 – 7 leaflets: flowers on leafy shoots from stems of the preceding year, in spring and early summer, with white spreading petals.*

* *Stems more or less woody: fruit black when ripe, eatable, the blackberries of the market, ripening in late summer and autumn.*

R. villòsus, HIGH BLACKBERRY. Everywhere along thickets, fence-rows, &c., and several varieties cult.: stems 1° – 6° high, furrowed; prickles strong and hooked; leaflets 3 – 5, ovate or lance-ovate, pointed, their lower surface and stalks hairy and glandular, the middle one long-stalked and sometimes

heart-shaped; flowers racemed, rather large, with short bracts; fruit oblong or cylindrical.

R. Canadénsis, Low B. or Dewberry. Rocky and sandy soil: long-trailing, slightly prickly, smooth or smoothish, and with 3 – 7 smaller leaflets than in the foregoing, the racemes of flowers with more leaf-like bracts, the fruit of fewer grains and ripening earlier.

R. cuneifòlius, Sand B. Sandy ground and barrens from N. Jersey S.: erect, 1° – 3° high, with stout hooked prickles; the branchlets and lower surface of the 3 – 5 wedge-obovate thickish leaves whitish-woolly; peduncles 2 – 4-flowered.

R. triviàlis, Southern Low B. Sandy soil from Virginia S.: trailing or creeping, bristly and prickly; the smooth partly evergreen leaves of 3 – 5 ovate-oblong or lance-oblong leaflets; peduncles 1 – 3-flowered.

* * *Stems scarcely woody but lasting over winter, wholly prostrate: fruit sour.*

R. híspidus, Running Swamp B. Low woods, &c. N.: with very long and slender running stems, beset with small reflexed prickles, sending up short leafy and flowering shoots; leaves of mostly 3 obovate blunt smooth and shining leaflets, of firm and thickish texture, somewhat evergreen; flowers small and few on a leafless peduncle; fruit of few grains, red or purple.

§ 4. Flowering Bramble: *cultivated for the flowers only.*

R. rosæfòlius, from China, called Brier Rose. Cult. in greenhouses and apartments, has pinnate leaves, and bears a succession of full-double white flowers resembling small roses.

11. ALCHEMÍLLA. (Name said to come from the Arabic.) A minute annual species, A. arvensis, called Parsley Piert in England, has got introduced in Virginia, &c.

A. vulgàris, Lady's Mantle, from Europe, is cult. in some gardens; it is a low herb, not showy, with somewhat downy rounded slightly 7 – 9-lobed leaves chiefly from the root, on long stalks, and loose corymbs or panicles of small light green flowers, through the summer. ♃

12. AGRIMÒNIA, AGRIMONY. (Old name, of obscure meaning.) Weedy herbs, in fields and border of woods, producing their small yellow flowers through the summer; the fruiting calyx, containing the 2 akenes, detached at maturity as a small bur, lightly adhering by the hooked bristles to the coats of animals. ♃

A. Eupatòria, Common A. Principal leaflets 5 – 7, oblong-obovate and coarsely toothed, with many minute ones intermixed; petals twice the length of the calyx; stamens 10 – 15.

A. parviflòra, chiefly S., has smaller flowers, 11 – 19 lanceolate principal leaflets, and 10 – 15 stamens.

A. incisa, only S., has 7 – 9 oblong or obovate and smaller principal leaflets, small flowers, and 5 stamens.

13. POTÈRIUM, BURNET. (Old Greek name, of rather obscure application.) ♃

P. Sanguisórba, Garden or Salad B. Common in old gardens, from Europe: nearly smooth, growing in tufts; leaves of many small ovate and deeply toothed leaflets; stems about 1° high, bearing a few heads of light green or purplish monœcious flowers, in summer, the lower flowers with numerous drooping stamens, several of the uppermost with pistil, the style ending in a purple tufted stigma.

P. Canadénse, or Sanguisórba Canadensis, Canadian or Wild B. Wet grounds N.: 3° – 6° high, nearly smooth, with numerous lance-oblong coarsely-toothed leaflets often heart-shaped at base, and cylindrical spikes of white perfect flowers, in late summer and autumn; stamens only 4, their long white filaments club-shaped.

14. RÒSA, ROSE. (The ancient Latin name of the Rose.)

§ 1. WILD ROSES *of the country: only the first species cultivated.*

* *Styles lightly cohering in a column and projecting out of the calyx-cup.*

R. setígera, PRAIRIE OR CLIMBING WILD ROSE. Rich ground, W. & S.: also planted, and partly the original of QUEEN-OF-THE-PRAIRIE, &c. double roses. Tall-climbing, armed with stout nearly straight prickles, not bristly; leaves with only 3 – 5 ovate acute leaflets; the corymbed flowers produced towards midsummer; stalks and calyx glandular; petals deep rose becoming nearly white.

* * *Styles separate, included in the calyx-tube, the stigmas closing its orifice: petals rose-color: stems not disposed to climb.*

R. Carolìna, SWAMP ROSE. Wet grounds: stems 4° – 8° high, with hooked prickles and no bristles; leaflets 5 – 9, smooth, dull above and pale beneath; flowers numerous in the corymb (in summer); the calyx and globular hip glandular-bristly.

R. lùcida, DWARF WILD ROSE. Dry or moist ground: 1° – 2° high, with bristly or slender straight prickles, 5 – 9 oblong or almost lanceolate leaflets shining above, 1 – 3-flowered peduncles, bristly calyx, but the depressed hip nearly smooth: fl. all summer.

R. blànda, EARLY WILD ROSE. Rocky banks N.: 1° – 3° high, with straight weak prickles or none, 5 – 7 oval or oblong blunt and pale leaflets, sometimes hoary beneath, large stipules, 1 – 3-flowered peduncles and the calyx smooth and glaucous, the hip globular: fl. spring or early summer.

§ 2. BRIER-ROSES, *naturalized from Europe, by roadsides and in thickets, or sometimes planted: flowering in summer.*

R. rubiginòsa, SWEET-BRIER. Tall, disposed to climb, armed with strong and hooked and some slender and awl-shaped prickles, the roundish and doubly-serrate small leaflets downy and beset with russet glands beneath, giving the aromatic fragrance; flowers mostly solitary, pink; hip pear-shaped or obovate, crowned with the calyx-lobes.

R. micrántha, SMALL S. Probably a mere variety of the common Sweet-Brier, with uniform hooked prickles, smaller flower, and more oblong or oval hip, from which the calyx-lobes fall early.

R. canìna, DOG ROSE. Roadsides E. Penn. and probably elsewhere: resembles Sweet-Brier, but the leaflets smooth or destitute of aromatic glands and simply serrate; flowers 3 or 4 together, pink or nearly white.

§ 3. EVERGREEN ROSES, *naturalized in the Southern States from China: flowering in spring, the flowers not double.*

R. Sínica (or LÆVIGÀTA), CHEROKEE ROSE. Planted for garden-hedges, &c., also run wild S., disposed to climb high, armed with strong hooked prickles, very smooth, with bright green and glossy evergreen leaves of mostly only 3 leaflets, and single flowers at the end of the branches, with bristly calyx-cup and large pure-white petals.

R. bracteàta, BRACTED ROSE. In hedges far S., not common; has downy branches armed with strong hooked prickles, 5 – 9 roundish leaflets, and single large white flowers on very short peduncle, the calyx covered by leafy bracts.

§ 4. EXOTIC GARDEN ROSES proper, *from Europe and Asia. Merely the principal types: the greater part of the modern garden roses too much mixed by crossing and changed by variation to be subjects of botanical study.*

* *Styles united in a column which projects out of the calyx-cup. All with long rambling shoots, or disposed to climb.*

R. sempérvirens, EVERGREEN ROSE of S., not hardy nor holding its leaves N., with coriaceous bright-green oblong leaflets, curved prickles, and nearly solitary white flowers, not double. The AYRSHIRE ROSE is a more hardy form of it.

R. moschàta, Muscat or Musk Rose; not climbing, with slender curved prickles, leaves of 5 or 7 lanceolate and pointed leaflets, a corymb of white flowers with a yellowish base to the petals, very sweet scented, especially at evening.

R. multiflòra, Many-flowered Rose. A well-known climbing species, from Japan and China, hardy in Middle States, with 5 or 7 soft and somewhat rugose leaflets, slender scattered prickles, and full corymbs of small flowers, white, pale red, or rose-purple, not sweet-scented. The Boursalt Rose, said to come from the *multiflora*, is probably from a cross with some hardy European species.

* * *Styles not sensibly projecting nor united.*

+ *Tender, tall-climbing, and wholly destitute of prickles.*

R. Bánksiæ, Banksia Rose, from China, a slender conservatory species, very smooth, with 3 – 5-lanceolate glossy leaflets, and umbels of very small white or buff and violet-scented flowers.

+ + *Tender, armed only with distant hooked prickles, smooth, with leaves of mostly* 3 (3 – 5) *rather coriaceous and shining leaflets, and awl-shaped or narrow stipules.*

R. Índica, India or China Roses: includes the Tea, Perpetual or Bengal, Bourbon, and Noisette Roses; and the Bengal Pompons, &c. are miniature forms of similar origin.

+ + + *Hardy or mainly so at the north, not climbing, more or less prickly, and with leaves of* 5 *or more leaflets.*

R. Gállica, French or Provence, Red Rose, has slender stems beset with both stout curved and slender straight prickles, leaves of 5 – 7 rather rigid doubly and glandular-toothed leaflets more or less downy beneath, erect 1-flowered peduncles, and pink-red or crimson spreading petals (or variegated with white), which have some astringency, and are used for *conserve of roses*, &c.

R. centifòlia, Hundred-leaved or Cabbage Rose, perhaps derived from the preceding: has mostly straight prickles, 5 – 7 oval leaflets with glandular teeth or edges, peduncle and calyx clammy with odorous glands, the hip bristly and glandular, the flowers mostly nodding, large, and full-double, rose-purple, or of various shades, rarely white. Pompon Roses are miniature varieties. Moss Roses are abnormal states with the glands and bristles of the calyx and peduncle developed into a moss-like substance. Petals used for *rose-water, essence of roses*, &c.

R. Damascèna, Damask Rose, &c. Known from the foregoing by the greener bark, larger curved prickles, corymbed flowers oblong in the bud, and with the long sepals (some of them pinnatifid or lobed) reflexed during flowering, the hip oblong and pulpy: petals rose-purple, white, &c.; used in preference for *attar-of-roses* and rose-water.

R. álba, White Rose, is between the preceding and the Dog Rose; leaflets 5, glaucous and a little downy beneath; prickles straightish and slender; petals pure white.

R. cinnamòmea, Cinnamon Rose, of Eu., met with in country gardens, is related to our wild R. blanda, 5° to 8° high, with brownish-red bark, and some straightish prickles, pale leaves downy underneath, and small pale-red cinnamon-scented (mostly double) flowers, not showy.

R. spinosíssima, Burnet or Scotch Rose, of Eu. Low, 1° or 2° high, exceedingly prickly with straight prickles, with 7 to 9 small and roundish smooth leaflets, and small early flowers, either single or double, and white, pink, and even yellow, the hips cartilaginous.

R. Eglantèria, Yellow Eglantine Rose. Like a Sweet-Brier, but lower, 3° – 5° high, with scattered straight prickles; leaves deep-green and sweet-scented; flowers deep yellow, orange, or buff, and sometimes variegated with red, either single or double.

R. sulphùrea, the old Yellow Rose, from the Far East. Tall, with scattered prickles, glaucous or pale scentless leaves, and sulphur-yellow (full-double) flowers.

15. CRATÆGUS, HAWTHORN, WHITE THORN. (Old Greek name.) Small trees or shrubs, with hard wood; flowers white, except in some varieties of English Hawthorn, in spring or early summer; ripening the red or reddish fruit mostly in autumn.

§ 1. *Flowers many in the corymb, small, with 5 styles; fruit not larger than small peas, scarlet or coral-red: leaves, &c., smooth or nearly so.*

C. Pyracántha, EVERGREEN THORN. Planted for ornament and sparingly nat. from S. Penn. S. (from S. Europe): shrub 4° – 6°, with the shining evergreen leaves lance-spatulate and crenulate, only 1′ long, and small clusters of flowers terminating short branches.

C. spathulàta. Tall shrub or low tree, from Virginia S., with almost evergreen shining spatulate leaves, crenate towards the apex, or on vigorous shoots cut-lobed, and with hardly any petiole.

C. cordàta, WASHINGTON T. Small tree, from Virg. and Kentucky S., and has been planted for hedges; has broadly triangular-ovate or heart-shaped thinnish leaves, often 3 – 5-cleft or cut and serrate, on slender petiole.

§ 2. *Flowers many in the corymb, middle-sized: fruit coral-red, ovoid, rather small.*

C. arboréscens. River-banks far S.: tree with few stout thorns or none, thin oblong serrate leaves acute at both ends, on slender petioles; styles 5.

C. Oxyacántha, ENGLISH HAWTHORN. Planted from Eu. for ornament and hedges; tree or shrub with obovate smooth leaves wedge-shaped at base, cut-lobed and toothed above; styles 2 or 3, rarely only 1. With single or double, white, rose, or pink-red flowers.

C. apiifòlia, PARSLEY-LEAVED T. Common S. Small tree soft-downy when young; the leaves smoothish with age, pinnatifid, the 5 – 7 lobes crowded, cut and toothed; petioles slender; styles 1 – 3.

§ 3. *Flowers many in the corymb, large; the calyx-teeth with the bracts and stipules often beset with glands: fruit edible, half an inch or more long, its cells or stones and the styles variable in number,* 1 – 5. *All tall shrubs or low trees, of thickets and rocky banks, or planted.*

C. coccínea, SCARLET-FRUITED T. Smooth, with the leaves thin, roundish-ovate, sharply cut-toothed or lobed, on slender petioles, the coral or scarlet fruit much smaller than in the next and hardly eatable.

C. tomentòsa, PEAR or BLACK T. Downy or soft-hairy when young; the leaves thickish, oval, ovate, or obovate, sharply toothed or cut, below abruptly narrowed into a margined petiole, the upper surface impressed along the main veins or ribs; flowers often 1′ broad, and scarlet or orange fruit from two thirds to three fourths of an inch long, pleasant-tasted. Of many varieties: the two which differ most from the common one with the well-flavored fruit are: Var. PUNCTÀTA, with smaller and wedge-obovate leaves irregularly toothed towards the summit, and dull red and yellowish fruit, sometimes white-dotted. Var. MÓLLIS, of the Western States, with rounded soft-downy leaves, not tapering but sometimes even heart-shaped at base, sharply doubly toothed and cut; fruit dull red and less pleasant-tasted.

C. Crus-gálli, COCKSPUR T. Smooth; the wedge-obovate or oblanceolate leaves thick and firm, deep-green and glossy, serrate above the middle, tapering into a very short petiole; thorns very long and sharp; fruit bright red. The best species for hedges: has both narrow and broad-leaved varieties.

§ 4. *Flowers solitary, in pairs, or only* 3 – 6 *in the corymb; styles, and cells,* 4 – 5: *leaves mostly pubescent underneath: fruit often eatable.*

C. æstivàlis, SUMMER HAW of S. States. Along pine-barren ponds, from S. Car. S. & W.: tree with spatulate or wedge-obovate coriaceous leaves, crenate above the middle, no glands, 3 – 5-flowered peduncles, and large red juicy fruit, pleasantly acid, used for tarts, &c.: ripe in summer.

C. flàva, YELLOW or SUMMER HAW. Sandy soil, from Virginia S.: small tree, with wedge-obovate leaves downy or smoothish, toothed or cut above the middle, the teeth or margins and short petiole glandular; the pear-shaped or globular fruit yellowish, greenish, or tinged with red.

C. parvifòlia, SMALL-LEAVED or DWARF THORN. Pine-barrens from N. Jersey S.: shrub 3° – 6° high, downy, with thick and firm spatulate-obovate crenate leaves, these as well as the mostly solitary flowers almost sessile, calyx-lobes glandular-toothed and as long as the petals; the large fruit pear-shaped or globular, at first hairy, greenish and yellowish.

16. COTONEÁSTER. (*Cotoneum* was a Roman name of the Quince. Name here alludes to the cottony covering of the shoots, lower face of the leaves, &c. of these small-leaved and small-flowered, chiefly Old-World shrubs.)

C. vulgàris. Planted from Eu.: hardy shrub, 2° – 4° high, much branched, with deciduous ovate or rounded leaves hardly 1′ long, glabrous calyx, flesh-colored or white flowers in spring, and reddish fruit. And some rarer, evergreen species are in choicer ornamental grounds.

17. PHOTÍNIA. (From Greek word for shining, alluding to the glossy leaves of the genuine species.) Choice greenhouse shrubs or small trees, hardy S., with large evergreen leaves.

P. arbutifòlia, of California, a smooth shrub, with rigid sharply-toothed leaves and broad panicle of white flowers, should be hardy S. of Penn.

P. serrulàta, of Japan and China, is smooth, with longer finely serrulate leaves, and copious white flowers.

P. (or **Eriobòtrya**) **Japónica,** the LOQUAT-TREE, of Japan, with almost entire leaves nearly 1° long, the lower surface and corymb clothed with dense rather rusty wool, has fewer and larger downy yellowish-white flowers, and an edible yellow fruit, resembling a small apple, with 1 – 5 large seeds.

18. AMELÁNCHIER, JUNE-BERRY, SERVICE-BERRY. (Popular name of the European species in Savoy.) Flowering in spring, and producing the berry-like purplish fruit (edible, sweet, sometimes very pleasant-flavored) in summer. We have apparently two or three wild species; but they run together so that botanists incline to regard them as forms of one.

A. Canádensis, also called SHADBUSH in New England, because it blossoms just when shad appear in the rivers. Var. BOTRYÀPIUM is the tree, smooth even from the first, or nearly so, with ovate-oblong very sharply serrate leaves, long loose racemes, and oblong petals 4 times the length of the calyx. Var. OBLONGIFÒLIA is either tree or shrub, with the oblong leaves and branchlets white-cottony when young, and the racemes and petals shorter. Var. ALNIFÒLIA, chiefly W., is a shrub with roundish blunt leaves toothed only towards the summit, and flowers like the preceding. Var. OLIGOCÁRPA, is a shrub of cold bogs N., very smooth, with thin oblong sharply-serrate leaves, and only 2 – 5 flowers in the raceme.

19. PỲRUS, PEAR, APPLE, &c. (Classical name of the Pear-tree.) Botanically the genus is made to include a great variety of things, agreeing in the cartilaginous, parchment-like, or thin-walled cells that contain the seeds. Wood hard and tough. Fl. spring.

§ 1. PEAR. *Leaves simple: flowers in a simple corymb or cluster: fruit with its base tapering down to the stalk.*

P. commùnis, COMMON PEAR. Cult. from Eu.: a smooth tree, with branches inclined to be thorny, ovate leaves, and pure white flowers, the anthers purple.

§ 2. APPLE. *Leaves simple: flowers showy, in a simple cluster or simple umbel: fruit sunken (umbilicate) at both ends, especially at the base.*

* *Exotic: leaves simply and evenly serrate, ovate or oblong.*

P. Màlus, COMMON APPLE. Cult. from Eu.: tree with buds, lower face of the leaves when young, and calyx woolly, flowers white and tinged with pink, and large fruit.

P. spectábilis, Chinese Flowering-A. Cult. from China, for its showy bright rose-colored flowers, which are double or semi-double; the leaves &c. smooth, except when very young.

P. prunifòlia, Siberian Crab-A. Cult. for the fruit: smooth or nearly so, except the newly developed leaves and the peduncles; styles woolly at the base; fruit yellowish. The better Crab-Apples are perhaps crosses of this with the Common Apple.

* * *Wild species, with some of the leaves irregularly cut-toothed, or even lobed: the bright rose-colored flowers and the greenish fruit very fragrant.*

P. coronària, American or Garland Crab-A. Glades from W. New York W. & S.: small tree, soon smooth, with the mostly ovate leaves rounded or obscurely heart-shaped at base and inclined to be 3-lobed.

P. angustifòlia, Narrow-leaved Crab-A. Glades W. & S., with narrow-oblong or lanceolate leaves: otherwise too like the last.

§ 3. Chokeberry. *Leaves simple, the upper face with some small glands along the midrib: flowers (white) in compound cymes terminating the branches: styles united at base: fruit berry-like.*

P. arbutifòlia, Common Chokeberry. Low woods and bogs; shrub with small obovate or oblong finely serrate leaves, and a juicy insipid berry, not larger than a pea, either purple or black, pear-shaped or globular.

§ 4. Rowan-Tree *or* Mountain-Ash. *Leaves odd-pinnate, of several (9–17) leaflets: flowers (numerous and white) in ample compound flat cymes terminating the branches of the season: fruit berry-like, scarlet-red when ripe. Trees often planted for ornament, especially for the clusters of showy fruit in autumn.*

P. Americàna, American Mountain-Ash. Slender tree or tall shrub, wild in the cooler districts; smooth or soon becoming so, with lanceolate taper-pointed and sharply serrate bright-green leaflets on a reddish stalk, pointed and smooth glutinous leaf-buds, and berries not larger than peas.

P. sambucifòlia, Elder-leaved R. or M. Wild along the northern frontiers; smooth or nearly so, with oblong or lance-ovate and blunt or abruptly short-pointed leaflets, coarsely serrate with more spreading teeth, sparingly hairy leaf-buds, and larger berries.

P. aucupària, European R. or M. Planted from Eu.; forms a good-sized tree, with oblong and obtuse paler leaflets, their lower surface, stalks, and the leaf-buds downy; and the berries larger ($\frac{1}{2}'$ in diameter).

20. CYDÒNIA, QUINCE. (Named from a city in Crete.)

C. vulgàris, Common Quince. Cult. from the Levant; small tree, nearly thornless, with oval or ovate entire leaves (Lessons, p. 50, fig. 112) cottony beneath; flowers solitary at the end of the leafy branches of the season, in late spring, with leafy calyx-lobes, white or pale-rose petals, and stamens in a single row; the large and hard fruit pear-shaped, or in one variety apple-shaped, fragrant; seeds mucilaginous.

C. Japónica, Japan Quince (also named Pyrus Japonica). Thorny, smooth, widely branched shrub, from Japan; cult. for the large showy flowers, which are produced in spring, earlier than the oval or wedge-oblong leaves, on side spurs, in great abundance, single or more or less double, scarlet-red, or sometimes with rose-colored or even almost white varieties; calyx with short and rounded lobes; fruit green, very hard, resembling a small apple, but totally uneatable.

39. CALYCANTHACEÆ, CALYCANTHUS FAMILY.

Shrubs with opposite entire leaves, no stipules, sepals and petals imbricated and indefinite in number and passing one into the other, stamens few or many with anthers turned outwards, all these parts on a hollow receptacle or calyx-cup in the manner of a rose-hip,

enclosing numerous pistils which ripen into akenes. Cotyledons rolled up from one margin. Flowers rather large, mostly aromatic, as is the wood also.

1. CALYCANTHUS. Flowers livid-purple or dull red, solitary in the axils or terminating leafy branches, with loose bracts passing to colored lanceolate sepals, and these into similar thickish petals, which are borne on the summit of the closed calyx-tube: within these are numerous short stamens; the outer 12 or more having anthers ending in a tip; the inner smaller and with imperfect anthers or none. Pistils enclosed in the fleshy cup; ovary with 2 ovules; styles slender. Akenes oval, coriaceous, enclosed in the leathery hip, which becomes about 2′ long.
2. CHIMONANTHUS. Flowers yellow and purplish, along naked shoots, sessile in axils of fallen leaves. Bracts and sepals scale-like, ovate, purplish or brownish. Petals honey-yellow, or the innermost red. Stamens with anthers only 5.

1. CALYCÁNTHUS, CAROLINA ALLSPICE or SWEET-SCENTED SHRUB. (Name from Greek for *cup* and *flower*.) All wild in U. S., and cult., especially the first, which has the more fragrant strawberry-scented blossoms. Fl. spring and all summer.

C. flóridus. Wild S. of Virginia in rich woods: leaves soft-downy beneath, 1′–3′ long, oval or oblong.

C. lævigàtus. Wild from S. Penn. S.: smooth and green, with oval or oblong leaves 1′–3′ long, and rather small flowers (1½′ across).

C. glaùcus. Wild from Virginia S.: like the foregoing, but with mostly larger and taper-pointed leaves, glaucous beneath.

C. occidentàlis, WESTERN C. Cult. from California: smooth, with ovate or ovate-oblong and slightly heart-shaped larger leaves (5′–6′ long), green both sides, the upper surface roughish; the brick-red flowers 3′ across, scentless; akenes hairy.

2. CHIMONÁNTHUS, JAPAN ALLSPICE. (Name in Greek means *winter-flower*; it flowers in the winter in a mild temperate climate.)

C. fràgrans. Shrub with long branches, which may be trained like a climber, smooth lance-ovate pointed leaves, and rather small fragrant flowers, hardy S. of Penn.

40. SAXIFRAGACEÆ, SAXIFRAGE FAMILY.

A large family not readily defined by any single characters; distinguished generally from Rosaceæ by having albumen in the seeds, ovaries partly or wholly united, and seldom any stipules; the herbs and most of the shrubs of the family have only as many or twice as many stamens, and fewer styles or stigmas, than there are petals or sepals. Flowers mostly perfect. — Besides the plants described, there may be met with in choice conservatories:

CUNÒNIA CÁPENSIS, a small tree from Cape of Good Hope, with opposite odd-pinnate leaves and a large stipule between their petioles on each side:

BAÙERA RUBIOÌDES, from Australia, a slender bushy shrub, with opposite leaves of 3 almost sessile narrow leaflets, looking like 6 simple leaves in a whorl, and pretty rose-colored widely open flowers in their axils.

I. Shrubs, with simple leaves (includes plants which have been ranked in two or three different families). None of the following have stipules, except Ribes. Seeds numerous.

§ 1. *Leaves alternate.*

1. RIBES. Leaves palmately veined and lobed ; sometimes with narrow stipules united with the base of the petiole. Calyx with its tube cohering with the ovary, and often extended beyond it, the 5 lobes usually colored like the petals. Petals and stamens each 5, on the throat of the calyx, the former small and mostly erect. Styles 2 or partly united into one ; ovary 1-celled with 2 parietal placentæ, in fruit becoming a juicy berry, crowned with the shrivelled remains of the rest of the flower.
2. ITEA. Leaves pinnately veined, not lobed. Flowers in a raceme. Calyx nearly free from the 2-celled ovary, 5-cleft. Petals lanceolate, much longer than the calyx, and inserted along with the 5 stamens near its base. Pod slender, 2-celled, splitting through the style and the partition.

§ 2. *Leaves opposite. Calyx-tube wholly coherent with the top-shaped or hemispherical ovary, but not at all extended beyond it.*

* *Stamens indefinite*, 20 – 40.

3. DECUMARIA. Flowers small, in a compound terminal cyme. Calyx minutely 7 – 10 toothed. Style thick. Petals 7 – 10, valvate in the bud. Pod small, top-shaped, many-ribbed, bursting at the sides between the ribs.
4. PHILADELPHUS. Flowers showy, often corymbed or panicled. Calyx with 4 or 5 valvate lobes. Petals 4 or 5, broad, convolute in the bud. Styles 3 – 5, usually somewhat united below. Ovary 3 – 5-celled, becoming a pod, which splits at length into as many pieces.

* * *Stamens only twice as many as the petals.* 8 *or* 10.

5. DEUTZIA. Flowers all alike and perfect, more or less panicled, showy. Lobes of the calyx 5. Petals 5, valvate with the edges turned inwards. Filaments flat, the 5 alternate ones longer, commonly with a tooth or fork on each side next the top. Styles 3 – 5, slender. Pod 3 – 5-celled.
6. HYDRANGEA. Flowers in cymes, commonly of two sorts, the marginal ones (or in high-cultivated plants almost all) enlarged and neutral, consisting of corolla-like calyx only (Lessons, p. 78, fig. 214) ; the others perfect, with a 4 – 5-toothed calyx, as many small petals valvate in the bud, and twice as many stamens with slender filaments. Style 2 – 5, diverging. Ovary 2 – 5-celled, becoming a small pod which opens at the top between the styles.

II. Herbs, forming the SAXIFRAGE FAMILY proper. Stipules none or confluent with the base of the petiole. Seeds usually many.

* *Stamens as many as the petals and alternate with them, usually* 5, *and a cluster of gland-tipped sterile filaments before each petal : stigmas mostly* 4, *directly over as many parietal placentæ.*

7. PARNASSIA. Flower solitary, terminating a scape-like stem ; the leaves mostly from the root, rounded, smooth, and entire. Calyx free from the ovary, of 5 sepals. Petals 5, veiny, imbricated in the bud. Styles none. Pod 1-celled, many-seeded.

* * *Stamens only as many as the petals,* 4 *or* 5 : *no sterile filaments : styles* 2 *and alternate with the placentæ or partition.*

8. HEUCHERA. Flowers small, in a long panicle, mostly on a scape. Calyx bell-shaped, the tube cohering below with the 1-celled ovary, and continued beyond it, above 5-cleft, and bearing 5 small spatulate erect petals at the sinuses. Styles slender. Pod 1-celled, 2-beaked at the apex, opening between the beaks.
9. BOYKINIA. Flowers in a corymb-like cyme. Calyx 5-lobed, the tube cohering with the 2-celled ovary. Petals 5, convolute in the bud, deciduous. Styles 2, short. Pod 2-celled, opening between the two beaks.

* * * *Stamens twice the number of the petals or the lobes of the calyx, mostly* 10 ; *pod commonly* 2-*lobed, beaked, or* 2, *rarely* 3 – 4, *nearly separate pods.*

+– *Petals entire, mostly* 5.

10. SAXIFRAGA. Flowers in cymes or panicles, or rarely solitary, perfect. Leaves simple or palmately cut. Petals imbricated in the bud. Pod 2-celled below, or 2 (rarely more) separate pistils and pods, many-seeded.
11. ASTILBE. Flowers in spikes or racemes collected in an ample compound panicle, sometimes polygamous or diœcious. Leaves ample, decompound.

Petals small, spatulate or linear. Little pods 2 or 3, nearly separate, opening down the inner suture, several-seeded.

12. TIARELLA. Flowers in a raceme. Calyx colored (white), 5-parted, and in the sinuses bearing 5 very narrow slender-clawed petals. Filaments and styles long and slender. Ovary 1-celled, with several ovules towards the base of the 2 parietal placentæ, 2-beaked; one of the beaks or carpels growing much more than the other and making the larger part of the lance-shaped membranaceous pod, which is few-seeded towards the bottom.

+ + *Petals* 5, *pinnatifid, very delicate.*

13. MITELLA. Flowers in a simple raceme or spike, small. Petals colored like the short open calyx (white or green). Stamens short. Styles 2, very short. Ovary and pod globular, 1-celled, with 2 parietal placentæ at the base, many-seeded, opening across the top.

+ + + *Petals none.*

14. CHRYSOSPLENIUM. Flowers yellowish-green, solitary or in a leafy cyme. Calyx-tube coherent with the ovary, the tube or expanded border with 4 or 5 blunt lobes. Stamens 8 or 10, very short. Styles 2, short, recurved. Pod obcordate, thin, its notched summit rising above the calyx-tube, 1-celled with 2 parietal placentæ, several-many-seeded.

1. RÌBES, CURRANT, GOOSEBERRY. (An Arabic name.) Leaves plaited in the bud, except the last species, often clustered in the axils of those of previous season. Fl. spring. Fruit mostly eatable.

§ 1. GOOSEBERRY. *Stems commonly with* 1 *or* 2 *thorns below the leafstalks or the clusters of leaves, often with numerous scattered prickles besides, these sometimes on the berry also.*

* *Cultivated species.*

R. speciòsum, SHOWY FLOWERING-GOOSEBERRY, of California: cult. for ornament, especially in England, likely to succeed in Southern Middle States, is trained like a climber; has small and shining leaves, 1–3 very handsome flowers on a hanging peduncle, the short-tubular calyx, petals, and long-projecting stamens deep red, so that the blossom resembles that of a Fuchsia; berry prickly, few-seeded.

R. Grossulària, GARDEN OR ENGLISH GOOSEBERRY. Cult. from Eu. for the well-known fruit; thorny and prickly, with small obtusely 3–5-lobed leaves, green flowers 1–3 on short pedicels, bell-shaped calyx, and large berry.

* * *Native species* (*chiefly N. & W.*), *passing under the general name of* WILD GOOSEBERRY, *with greenish or dull-purplish blossoms, only* 1–3 *on each peduncle.*

R. hirtéllum, the commonest E., is seldom downy, with very short thorns or none, very short peduncles, stamens and 2-cleft style scarcely longer than the bell-shaped calyx; and the smooth berry purple, small, and sweet.

R. rotundifòlium, commoner W., is often downy-leaved; peduncles slender, the slender stamens and 2-parted style longer than the narrow calyx; berry smooth.

R. Cynósbati, of rocky woods N., is downy-leaved, with slender peduncles, stamens and undivided style not exceeding the broad calyx, and large berry usually prickly.

* * * *Native species with the prickly stems of a Gooseberry, but with a raceme of flowers like those of a Currant.*

R. lacústre, LAKE OR SWAMP G. Cold bogs and wet woods N.: low, with 3–5-parted leaves, their lobes deeply cut, very small flowers with broad and flat calyx, short stamens and style, and small bristly berries of unpleasant flavor.

§ 2. CURRANT. *No thorns nor prickles, and the flowers numerous in the racemes.*

* *Wild, or cultivated for the fruit: flowers greenish or whitish.*

+ *Leaves without resinous dots: calyx flat and open: berries red* (*or white*).

R. prostràtum, FETID C. Cold woods N.; with reclining stems, deeply heart-shaped and acutely 5–7-lobed leaves, erect racemes, pedicels and pale-red

berries glandular-bristly; these and the bruised herbage exhale an unpleasant, skunk-like odor.

R. rùbrum, Red C. Cult from Eu., also wild on our northern borders; with straggling or reclining stems, somewhat heart-shaped moderately 3–5-lobed leaves, the lobes roundish, and drooping racemes from lateral buds distinct from the leaf-buds; edible berries red, or a white variety.

†† *Leaves sprinkled with resinous dots: flowers larger, with oblong-bell-shaped calyx: berries larger, black, aromatic and spicy, glandular-dotted.*

R. flóridum, Wild Black C. Woods N.: leaves slightly heart-shaped, sharply 3–5-lobed and doubly serrate; racemes drooping, downy, bearing many whitish flowers, with conspicuous bracts longer than the pedicels.

R. nìgrum, Garden Black C. Cult. from Eu.: like the preceding, but has greener and fewer flowers in the raceme, minute bracts, and a shorter calyx.

** *Cultivated for ornament from far W.: the flowers highly colored.*

R. sanguíneum, Red-fl. C., from Oregon and California: glandular and somewhat clammy, with 3–5-lobed leaves whitish-downy beneath, nodding racemes of rose-red flowers, the calyx-tube oblong-bell-shaped, the berries glandular and insipid.

R. aùreum, Golden, Buffalo, or Missouri C.: from W. Missouri to Oregon; abundantly cult. for its spicy-scented bright-yellow flowers in early spring; smooth, with rounded 3-lobed and cut-toothed leaves (which are rolled up in the bud), short racemes with leafy bracts, and tube of the yellow calyx very much longer than the spreading lobes; the berries blackish, insipid.

2. ÌTEA. (Greek name of Willow, applied to something widely different.)

I. Virgínica, a tall shrub, in low pine-barrens from N. Jersey S., smooth, with oblong minutely serrate leaves, and racemes of pretty white flowers, in early summer.

3. DECUMÀRIA. (Name probably meaning that the parts of the flower are in tens, which is only occasionally the case.)

D. bárbara. Along streams S.: a tall, mostly smooth shrub, with long branches disposed to climb, ovate or oblong shining leaves, and a compound terminal cyme of small white odorous flowers, in late spring.

4. PHILADÉLPHUS, MOCK-ORANGE, SYRINGA (which is the botanical name of the Lilac. The generic name is an ancient one, afterwards applied to these shrubs for no particular reason). Ornamental shrubs; natives of the S. Atlantic and Pacific States, Japan, &c.; the species mixed or much varied in cultivation. The following are the principal types.

P. coronàrius, Common Mock-Orange. Cult. probably from Japan. Shrub with erect branches, smoothish oblong-ovate leaves having the taste and smell of cucumbers, and crowded clusters of handsome and odorous cream-white flowers, in late spring.

P. latifòlius, Broad-leaved M. Cult., unknown wild, has the erect stems of the first, is robust, 6°–12° high, with the ovate and toothed 5-ribbed leaves hairy beneath, and large pure-white and nearly scentless flowers clustered, in early summer.

P. inodòrus, Scentless M. Wild in upper districts S.: shrub smooth, with spreading slender branches, mostly entire ovate-oblong leaves, rather small flowers scattered at the end of the diverging branchlets, and calyx-lobes not longer than the ovary.

P. grandiflòrus, Large-fl. M. Wild along streams from Virginia S., and planted in several varieties: tall shrub, with long recurving branches, ovate and pointed usually toothed smoothish or slightly downy leaves, and very large pure-white scentless flowers, in early summer, either single or in loose clusters at the end of the branches, the slender-pointed calyx-lobes much longer than the ovary.

P. Gordonianus, cult. from Oregon, is seemingly a variety of the last, very tall, and the large flowers appearing at midsummer.

P. hirsùtus, HAIRY M. Wild in N. Car. and Tenn., sparingly cult.: slender, with recurving branches, the small ovate and acute sharply-toothed leaves hairy, and beneath even hoary; the small white flowers solitary or 2 - 3 together at the end of short racemose side branchlets.

5. DEÚTZIA. (Named for one *Deutz*, an amateur botanist of Amsterdam.) Fine flowering shrubs of Japan and China, with numerous panicles of white blossoms, in late spring and early summer; the lower side of the leaves, the calyx, &c. beset with minute starry clusters of hairs or scurf.

D. grácilis, the smallest species, is 2° high, with lance-ovate sharply serrate leaves bright green and smooth, and rather small snow-white flowers, earlier than the rest, often forced in greenhouses; filaments forked at the top.

D. crenàta. Commonly planted; a tall shrub, rough with the fine pubescence, with pale ovate or oblong-ovate minutely crenate-serrate leaves, and rather dull white blossoms in summer; the filaments broadest upwards and with a blunt lobe on each side just below the anther. This is generally cult. under the name of the next, viz.

D. scàbra, with more rugose and rougher finely sharp-serrate leaves, and entire taper-pointed filaments: seldom cult. here.

6. HYDRÁNGEA. (Name of two Greek words meaning *water* and *vase;* the application obscure.) Fl. summer.

* *Cultivated from China and Japan: house-plants N., turned out for summer.*

H. Horténsia, COMMON HYDRANGEA, is very smooth, with large and oval, coarsely toothed, bright-green leaves, and the flowers of the cyme nearly all neutral and enlarged, blue, purple, pink, or white.

* * *Wild species, on shady banks of rivers, &c., but often planted for ornament. Styles mostly only 2: flowers white, the sterile enlarged ones turning greenish or purplish with age, persistent.*

H. quercifòlia, OAK-LEAVED H. Stout shrub 3° - 6° high, very leafy, downy, with oval 5-lobed large leaves, and cymes clustered in oblong panicle, with numerous sterile flowers. Wild from Georgia S., hardy N. in cult.

H. radiàta, called more fittingly H. NÍVEA, having the ovate or somewhat heart-shaped pointed leaves very white-woolly beneath, but smooth and green above; the flat cyme with a few enlarged sterile flowers round the margin. Wild S. of Virginia.

H. arboréscens, wild from Penn. and Ill. S., rarely planted, is smooth, with ovate or slightly heart-shaped serrate pointed leaves green both sides, the flat cyme often without any enlarged sterile flowers, but sometimes with a full row round the margin.

7. PARNÁSSIA, GRASS-OF-PARNASSUS. Wild on wet banks; the large white flower handsome, in summer and autumn. 2

P. Caroliniàna, the only common species, both N. & S., has the scape or stem 1° - 2° high, bearing one clasping leaf low down, and terminated with a flower over 1′ broad, the many-veined petals sessile, with 3 stout small sterile filaments before each.

P. palústris, scarce on northern borders, is small throughout, with several slender filaments before each few-veined petal.

P. asarifòlia, along the Alleghanies S., has rather kidney-shaped leaves, and petals narrowed at base into a short claw; otherwise like the first.

8. HEÙCHERA, ALUM-ROOT, the rootstock being astringent. (Named for a German botanist, *Heucher.*) Wild plants of rocky woods, chiefly W. and S. along the middle country; the leaves rounded heart-shaped and more or less lobed or cut, mostly from the rootstock, often one or two on the tall stalk of the panicle. Flowers mostly greenish, in summer. 2

* *Flowers very small: stamens and styles protruding.*

H. Americàna, COMMON A.: the only one N. and E. of Penn., has scapes and loose panicle (2°–3° high) clammy-glandular and often hairy, leaves with rounded lobes, and greenish flowers in early summer.

H. villòsa, from Maryland and Kentucky S. along the upper country, is lower, beset with soft often rusty hairs, has deeper-lobed leaves, and very small white or whitish flowers, later in summer.

* * *Flowers larger (the calyx fully ¼′ long), in a narrower panicle, greenish, with stamens little if at all protruding: leaves round and slightly 5–9-lobed.*

H. híspida. Mountains of Virginia and N. W. Tall (scape 2°–4° high), usually with spreading hairs; stamens a little protruding.

H. pubéscens. From S. Penn. S. Scapes (1°–3° high) and petioles roughish-glandular rather than pubescent; stamens shorter than the lobes of the calyx.

9. BOYKÍNIA. (Named for the late *Dr. Boykin,* of Georgia.) 2l

B. aconitifòlia, occurs only along the Alleghanies from Virginia S.: stem clammy-glandular, bearing 3 or 4 alternate palmately 5–7-cleft and cut leaves and a cyme of rather small white flowers, in summer. There is one very like it in Oregon and California.

10. SAXÍFRAGA, SAXIFRAGE. (Latin name, means *rock-breaker;* many species rooting in the clefts of rocks.) Besides the following, there are a number of rare or local wild species.

* *Wild species, with leaves all clustered at the perennial root, the naked scape clammy above and bearing many small flowers in a panicle or cyme, the two ovaries united barely at the base, making at length a pair of nearly separate divergent pods.*

S. Virginiénsis, EARLY S. On rocks and moist banks; with obovate or wedge-spatulate thickish more or less toothed leaves in an open cluster, scape 3′–9′ high, bearing in early spring white flowers in a dense cluster, which at length opens into a loose panicled cyme; calyx not half the length of the petals; pods turning purple.

S. Pennsylvánica, SWAMP S. In low wet ground N.; with lance-oblong or oblanceolate obtuse leaves (4′–8′ long) obscurely toothed and narrowed into a very short broad petiole, scape 1°–2° high, bearing small greenish flowers in an oblong cluster, opening with age into a looser panicle (in spring); the reflexed lobes of the calyx as long as the lance-linear petals.

S. eròsa, LETTUCE S. Cold brooks, from Penn. S. along the Alleghanies; the lance-oblong obtuse leaves (8′–12′ long) sharply erosely toothed; scape 1°–3° high, bearing a loose panicle of slender-pedicelled small white flowers (in summer); with reflexed sepals as long as the oval petals, and club-shaped filaments.

* * *Exotic species, cult. for ornament: leaves all clustered at the perennial root: ovaries 2, or sometimes 3–4, almost separate, becoming as many nearly distinct pods.*

S. crassifòlia, THICK-LEAVED S. Cult. from Siberia, very smooth, with fleshy and creeping or prostrate rootstocks, sending up thick roundish-obovate nearly evergreen leaves, 6′–9′ long, and scapes bearing an ample at first compact cyme of large bright rose-colored flowers, in early spring.

S. sarmentòsa, BEEFSTEAK S., also called STRAWBERRY GERANIUM. Cult. from China and Japan as a house-plant, not quite hardy N., rather hairy, with rounded heart-shaped or kidney-shaped and doubly toothed leaves of fleshy texture, purple underneath, green-veined or mottled with white above, on shaggy petioles, from their axils sending off slender strawberry-like runners, by which the plant is multiplied, and scapes bearing a light very open panicle of irregular flowers, with 3 of the petals small rose-pink and yellow-spotted, and 2 much longer and nearly white ones lanceolate and hanging.

11. ASTÍLBE. (Name means *not shining.*) Also called HOTEÌA, after a Japanese botanist. Fl. summer. 2

A. decándra. Rich woods along the Alleghanies from Virginia S.: a tall, rather pubescent herb, 3° - 5° high, imitating Spiræa Aruncus (p. 121) in appearance, but coarser; leaflets of the decompound leaves mostly heart-shaped, cut toothed (2′ - 4′ long); flowers greenish-white, with inconspicuous petals.

A. Japónica, or HOTEIA JAPONICA. Cult. from Japan for ornament: only 1° - 2° high, with leaflets of the thrice-ternate leaves lance-ovate or oblong, and crowded white flowers of considerable beauty.

12. TIARÉLLA, FALSE MITREWORT. (Diminutive of *tiara*, a turban; name not very appropriate.) 2

T. cordifòlia, our only species, in rocky woods, especially N.: a low and hairy herb, spreading by summer leafy runners; leaves rounded heart-shaped, sharply lobed and toothed; flowers in a short raceme on a leafless scape, bright white, in spring.

13. MITÉLLA, MITREWORT, BISHOP'S-CAP. (Name means *a little mitre*, from the shape of the 2-cleft ovary and young pod.) Delicate plants of moist woods, especially N., spreading by summer leafy runners or rootstocks: fl. late spring and early summer. 2

M. diphýlla, COMMON or TWO-LEAVED M. Hairy, with rounded heart-shaped and somewhat 3 - 5-lobed root-leaves on slender petioles, and a pair of opposite nearly sessile leaves on the scape below the slender raceme of many white flowers.

M. nùda, NAKED-STALKED M. Mossy woods N.: a delicate little plant, with roundish kidney-shaped doubly crenate leaves, and leafless scape (4′ - 6′ high) bearing a few greenish blossoms.

14. CHRYSOSPLÈNIUM, GOLDEN SAXIFRAGE. (Name in Greek means *golden spleen.*) Fl. spring. 2

C. Americànum, our only species, in springs or shady wet places N.: a low and delicate smooth herb, with spreading repeatedly forked stems, tender succulent small leaves, which are roundish, obscurely crenate-lobed, and mainly opposite; the inconspicuous greenish flowers nearly sessile in the forks.

41. CRASSULACEÆ, ORPINE FAMILY.

Succulent plants, differing from the Saxifrage Family mainly in the complete symmetry of the flowers, the sepals, petals, stamens, and pistils equal in number, or the stamens of just double the number; the pistils all separate and forming as many (mostly many-seeded) little pods, except in Penthorum, where they are united together. (Lessons, p. 81, fig. 222 - 225.) Penthorum, which is not succulent, is just intermediate between this family and the foregoing. Several are monopetalous, i. e. have their petals united below into a cup or tube.

§ 1. *Leaves not at all fleshy, but thin and membranaceous: the 5 ovaries united into one 5-horned 5-celled pod: no scales behind the ovaries.*

1. PENTHORUM. Sepals 5. Petals 5, small, or usually none. Stamens 10. Pod opening by the falling away of the 5 beaks, many-seeded. Rarely the parts are in sixes or sevens.

§ 2. *Leaves thickened and succulent: ovaries separate, a minute scale behind each.*

* *Petals separate: sepals nearly so or united at the base.*

2. SEMPERVIVUM. Sepals, narrow petals, and pistils 6 - 12 or even more, and stamens twice as many. Plants usually multiplying by leafy offsets, on which the leaves are crowded in close tufts like rosettes.

3. SEDUM. Sepals, narrow petals, and pistils 4 or 5; the stamens twice as many, the alternate ones commonly adhering to the base of each petal.
4. TILLÆA. Sepals, petals, stamens, and few-seeded pistils 3 or 4. Very small annuals, with axillary flowers.
5. CRASSULA. Sepals or lobes of the calyx, petals, stamens, and many-seeded pistils 5. Perennial herbs or fleshy-shrubby plants, with flowers in cymes or clusters.

* * *Petals united by their edges below, and bearing the stamens.*

+ *Calyx 5-cleft or 5-parted: pistils 5.*

6. ROCHEA. Corolla salver-form, longer than the calyx. Stamens 5.
7. COTYLEDON. Corolla urn-shaped, bell-shaped, or cylindrical, sometimes 5-angled. Stamens 10.

+ + *Calyx and corolla both 4-lobed at summit: pistils 4.*

8. BRYOPHYLLUM. Calyx inflated; the lobes of the corolla at length projecting and spreading. Stamens 8, projecting. Leaves opposite, petioled, simple or odd-pinnate, crenate.

1. PÉNTHORUM, DITCH STONE-CROP. (Name from the Greek, apparently alluding to the parts of the flower being in fives.) ♃

P. sedoìdes. Wet places, especially by roadsides: a homely weed, about 1° high, with alternate lanceolate and serrate leaves, and yellowish-green inconspicuous flowers loosely spiked on one side of the branches of an open cyme, all summer and autumn.

2. SEMPERVÌVUM, HOUSELEEK. (Latin for *live-for-ever.*) ♃

S. tectòrum, COMMON or ROOF HOUSELEEK, the plant in Europe usually grown upon roofs of houses: propagating abundantly by offsets on short and thick runners; leaves of the dense clusters oval or obovate, smooth except the margins, mucronate; those on the flowering stems scattered, oblong, clammy-pubescent, as well as the clustered purplish or greenish flowers; sepals, petals, and pods mostly 12. Cult. in country gardens, and on walls, roofs, &c.: rarely flowering, in summer.

3. SÈDUM, STONE-CROP, ORPINE. (Old name, from *sedeo,* to sit, i. e. upon rocks, walls, &c., upon which these plants often flourish, with little or no soil.) The following are all smooth perennials, and hardy N. except the first species.

§ 1. *Leaves flat and broad, oblong, obovate, or rounded,*

* *The lower ones at least whorled in threes.*

S. Siebóldii, SIEBOLD'S S. Cult. from Japan, mostly in pots; with slender and weak or spreading stems, glaucous and mostly reddish-tinged round and often concave leaves (1′ or less long), with a wedge-shaped base and wavy-toothed margin, all in whorls up to the cyme of rosy-purple flowers, which all have their parts in fives.

S. ternàtum, THREE-LEAVED S. Wild in rocky woods from Penn. S. & W., and common in gardens; with spreading stems creeping at base and rising 3′ – 6′ when they blossom; the lower leaves wedge-obovate and whorled; the upper oblong and mostly scattered, about ½′ long; flowers white, the first or central one with parts generally in fives, the others sessile along the upper side of the usually 3 spreading branches and mostly with their parts in fours; in late spring.

* * *All or most of the leaves alternate: flowers in a corymb-like terminal cyme, purple or purplish, in summer, all with their parts in fives.*

S. Telèphium, GARDEN ORPINE or LIVE-FOR-EVER. Cult. from Eu. in old country gardens: erect, about 2° high, with oval and mostly wavy-toothed pale and thick leaves, small and dull-colored flowers in a compound cyme, and short-pointed pods.

S. telephioìdes, WILD O. or L. Dry rocks on mountains, chiefly along the Alleghanies; 6′ – 12′ high, very like the last, but with fewer flowers, and pods tapering into a slender style.

§ 2. *Leaves narrow and thick, barely flattish or terete: low or creeping plants.*

S. àcre, Mossy S., or Wall-Pepper. Cult. from Eu., for edgings and rock-work, running wild in some places: a moss-like little plant, forming mats on the ground, yellowish-green, with very succulent and thick ovate small and crowded leaves, and yellow flowers in summer, their parts in fives.

S. pulchéllum, Beautiful S. Wild S. W. on rocks; also cult. in gardens, &c.; spreading and rooting stems 4′–12′ long; leaves crowded, terete, linear-thread-shaped; flowers rose-purple, crowded on the upper side of the 4 or 5 spreading branches of the cyme, their parts mostly in fours, while those of the central or earliest flower are in fives: in summer.

S. cárneum, variegàtum. Cult. of late for borders, &c., of unknown origin; has creeping stems, and the small leaves mostly opposite, sometimes in threes, linear, flattish, acute, very pale green, and white-edged: flowers not yet seen.

4. TILLÆA. (Named for an Italian botanist, *Tilli.*) Fl. all summer. ①

T. símplex, is a minute plant of muddy river-banks along the coast, spreading and rooting, only 1′–2′ high, with linear-oblong opposite leaves, and solitary inconspicuous white flowers sessile in their axils.

5. CRÁSSULA. (So named from the incrassated leaves.) House-plants, occasionally cult., from Cape of Good Hope. ♃

C. arboréscens. Fleshy shrub, with glaucous roundish-obovate leaves (2′ long) tapering to a narrow base, and dotted on the upper face; the flowers rather large and rose-colored.

C. láctea, has greener and narrower-obovate leaves, connate at the base in pairs, and a panicle of smaller white flowers.

C. falcàta, has slightly woody stems, oblong and rather falcate or curved leaves connate at base, 3′–4′ long, powdery-glaucous, and a compound cyme of many red sweet-scented flowers, the petals with erect claws partly united below, and spreading abruptly above; so that the plant has been placed under the next genus, and named Rochea falcata.

6. RÒCHEA. (Named for a Swiss physician, *Laroche.*) Half-shrubby succulent house-plants of the Cape of Good Hope. ♃

R. coccínea. Stems 1°–2° high, thickly beset with the oblong-ovate (1′ long) leaves up to the terminal and umbel-like sessile cluster of handsome flowers; tube of the scarlet-red corolla 1′ long.

7. COTYLÈDON. (From Greek word for a *shallow cup.*) House-plants, not common. ♃

C. orbiculàta. Half-shrubby succulent plant, from Cape of Good Hope, with opposite white-powdery or glaucous wedge-obovate leaves (2′–4′ long), and a cluster of showy red flowers (nearly 1′ long) raised on a slender naked petiole, the cylindraceous tube of the corolla longer than the recurved lobes.

C. (or **Echevèria**) **coccínea,** from Mexico, is shrubby at base, with the wedge-obovate acute leaves in rosettes, and alternate and scattered on the flowering stems; flowers in a leafy spike, the 5-parted corolla not longer than the spreading calyx, 5-angled at base, red outside, yellow within.

8. BRYOPHÝLLUM. (Name of Greek words for *sprout* or *bud* and *leaf.*) ♃

B. calycìnum. A scarcely shrubby succulent plant, originally from tropical Africa, cult. in houses, &c., with opposite petioled leaves, 3 or 5 pinnate leaflets, or the upper of single leaflets, and an open panicle of large and rather handsome hanging green flowers tinged with purple: the calyx is oblong and bladdery; out of it the tubular corolla at length projects, and has 4 slightly spreading acute lobes; the leaflets oval, 2–3 inches long, crenate; when laid on the soil, or kept in a moist place, they root and bud at the notches, and produce little plants. The name refers to the propagation of the plant in this way.

42. HAMAMELACEÆ, WITCH-HAZEL FAMILY.

Shrubs or trees, with alternate simple leaves, deciduous stipules, small flowers in heads, spikes, or little clusters, the calyx united below with the base of the 2-styled ovary, which forms a hard or woody 2-celled and 2-beaked pod, opening at the summit. Stamens and petals when present inserted on the calyx. Three wild plants of the country, belonging to as many genera.

§ 1. *Shrubs, with perfect or merely polygamous flowers, a regular calyx, and a single ovule, becoming a bony seed, suspended from the top of each cell.*

1. HAMAMELIS. Flowers in small clusters in the axils of the leaves, expanding late in autumn, ripening the seeds late the next summer. Calyx 4-parted. Petals 4, strap-shaped. Stamens 8, very short; the 4 alternate with the petals bearing anthers, the 4 opposite them imperfect and scale-like. Styles short. Pod with an outer coat separating from the inner.
2. FOTHERGILLA. Flowers in a scaly-bracted spike, in spring, rather earlier than the leaves. Calyx bell-shaped, slightly 5 – 7-toothed. Petals none. Stamens about 24, rather showy, the long and club-shaped filaments bright white. Styles slender. Pod hairy.

§ 2. *Tree, with monœcious small flowers, in dense heads or clusters, destitute both of calyx and corolla, the fertile with many ovules in each cell, but only one or two ripening into scale-like seeds.*

3. LIQUIDAMBAR. Heads of flowers each with a deciduous involucre of 4 bracts, the sterile in a conical cluster, consisting of numerous short stamens with little scales intermixed; the fertile loosely racemed or spiked on a drooping peduncle, composed of many ovaries (surrounded by some little scales), each with 2 awl-shaped beaks, all cohering together and hardening in fruit.

1. HAMAMÈLIS, WITCH-HAZEL. (An old Greek name of Medlar, inappropriately transferred to this wholly unlike American shrub.)

H. Virgínica. Tall shrub, of damp woods, with the leaves obovate or oval, wavy-toothed, straight-veined like a Hazel, slightly downy; the yellow flowers remarkable for their appearance late in autumn, just as the leaves are turning and about to fall. Seeds eatable.

2. FOTHERGÍLLA. (Named for *Dr. Fothergill* of London, a friend and correspondent of Bartram.)

F. alnifòlia. Low, rather ornamental shrub, in swamps, from Virginia S., with oval or obovate straight-veined leaves, toothed at the summit and often hoary beneath, the white flowers in spring.

3. LIQUIDÁMBAR, SWEET-GUM TREE or BILSTED. (Names allude to the fragrant terebinthine juice or balsam which exudes when the trunk is wounded.)

L. Styracíflua, the only species of this country: a large and beautiful tree in low grounds, from S. New England to Ill. and especially S., with fine-grained wood, gray bark forming corky ridges on the branches, and smooth and glossy deeply 5 – 7-lobed leaves, which are fragrant when bruised, changing to deep crimson in autumn, their triangular lobes pointed and beset with glandular teeth: greenish flowers appearing with the leaves in early spring.

43. HALORAGEÆ, WATER-MILFOIL FAMILY.

Contains a few insignificant aquatic or marsh plants, with small greenish flowers sessile in the axils of the (often whorled) leaves or bracts, and a single ovule and seed suspended in each of the 1 – 4 cells of the ovary.

1. MYRIOPHYLLUM. Flowers mostly monœcious, with sepals or teeth of the calyx, petals when there are any, lobes and cells of the ovary and nut-like fruit, and the sessile stigmas each 4; the stamens 4 or 8.
2. PROSERPINACA. Flowers perfect, with lobes of the calyx, stamens, stigmas, and cells of the 3-angled nut-like fruit each 3: petals none.
3. HIPPURIS. Flowers mostly perfect, with truncate calyx not continued above the adherent ovary, and a single stamen, slender style, and seed.

1. MYRIOPHÝLLUM, WATER-MILFOIL. (Botanical name, from the Greek, like the popular name, means *thousand-leaved.*) Plants usually all under water, except their flowering tips; all but the uppermost or emerging leaves pinnately dissected into fine hair-like divisions. Fl. summer. ♃

M. spicàtum. Leaves whorled in threes or fours, those at the summit of flowering stems reduced to small ovate bracts shorter than the flowers, which therefore form an interrupted spike; petals deciduous; stamens 8; fruit smooth.

M. verticillàtum. Like the first, but the uppermost leaves longer than the flowers and pinnatifid.

M. heterophýllum. Chiefly W. & S.; with leaves whorled in fours or fives, those under the flowers ovate or lanceolate and serrate or merely pinnatifid; stamens and petals 4; fruit roughish on the back.

M. scabràtum. Chiefly S. & W.; with leaves and flowers as in the preceding, but more slender, the leaves under the flowers linear and cut-toothed, and the lobes of the fruit 2-ridged and roughened on the back.

M. ambíguum. Common only E.: with mostly scattered very delicate or capillary leaves, often perfect flowers, 4 petals and 4 stamens, and a minute smooth fruit.

2. PROSERPINÀCA, MERMAID-WEED. (Name from Latin *proserpo,* to creep, or after *Proserpine.*) Stems creeping at base in the mud or shallow water, the upper part emerging: flowers in the axils of the alternate leaves, produced all summer. ♃

P. palùstris. Leaves above water lanceolate and merely serrate; fruit sharply 3-angled.

P. pectinàcea. Leaves all pinnately divided into very slender divisions; angles of the fruit bluntish. Chiefly E. & S.

3. HIPPÙRIS, MARESTAIL (which the botanical name means in Greek).

H. vulgàris. In ponds and springs N. & W., but rare: stems 1° – 2° high, the linear acute leaves in whorls of 8 – 12, the upper ones with minute flowers in their axils. ♃

44. ONAGRACEÆ, EVENING-PRIMROSE FAMILY.

Herbs, or sometimes shrubs, without stipules; the parts of the symmetrical flowers in fours (rarely in twos to fives) throughout; the tube of the calyx usually prolonged more or less beyond the adherent ovary, its lobes valvate in the bud, its throat bearing the petals (convolute in the bud) and the as many or twice as many stamens; styles always united into one. Embryo filling the seed: no albumen. Comprises many plants with showy blossoms, cultivated for ornament; these almost all American. (Lopezia has irregular flowers with only one perfect stamen.)

§ 1. *Parts of the flower in twos.*

1. CIRCÆA. Delicate low herbs, with opposite thin leaves, and very small whitish flowers in racemes. Calyx with 2 reflexed lobes, its tube slightly prolonged beyond the 1 – 2-celled ovary, which becomes a 1 – 2-seeded little bur-like indehiscent fruit, covered with weak hooked bristles. Petals 2, obcordate. Stamens 2. Style slender, tipped with a capitate stigma.

§ 2. *Parts of the flower in fours, or fives in No. 8.*

* *Ovary and dry nut-like fruit with a single ovule or seed in each cell.*

2. GAURA. Herbs with alternate sessile leaves, and small or smallish flowers in racemes or spikes Calyx with slender tube much prolonged beyond the 4-celled ovary. Petals 4, on claws, mostly turned toward the upper side of the flower. Stamens 8, these and the long style turned town. A little scale before each filament. Fruit small, 4-angled or ribbed, 1 – 4-seeded.

* * *Ovary and fruit with many ovules and seeds in each of the cells.*

+– *Herbs: fruit a chiefly 4-celled and 4-valved dry pod.*

+–+– *Seeds furnished with a coma or tuft of long and soft hairs at one end, by which they are widely dispersed by the wind.*

3. EPILOBIUM. Calyx with tube scarcely at all extended beyond the linear ovary. Petals 4. Stamens 8.

4. ZAUSCHNERIA. Calyx extended much beyond the linear ovary into a funnel-shaped tube, with an abruptly inflated base where it joins the ovary, and with 4 lobes as long as the 4 oblong-obcordate petals, both of bright scarlet color. Stamens 8 and, as well as the long style, projecting.

+–+– *Seeds naked, i. e. without a downy tuft.*

= *Flowers regular and symmetrical: calyx-tube extended more or less beyond the ovary, the lobes mostly reflexed: petals* 4.

5. CLARKIA. Calyx-tube continued beyond the ovary into a short funnel-form cup. Petals broad, wedge-shaped or rhombic, sometimes 3-lobed, raised on a slender claw. Stamens 8, with slender filaments, the alternate ones shorter: anthers curved or coiled after opening, those of the short stamens much smaller, or deformed and sterile. Stigmas 4, oval or oblong. Pod linear and tapering upwards, 4-sided. Flowers never yellow.

6. EUCHARIDIUM. Calyx-tube much prolonged and slender beyond the ovary. Petals wedge-shaped and 3-lobed at summit, tapering into a short claw. Stamens only 4, on slender filaments. Stigmas 2 or 4. Pod oblong-linear. Seeds slightly wing-margined. Flowers never yellow.

7. ŒNOTHERA. Calyx-tube either much or little prolonged beyond the ovary. Petals usually obovate or obcordate, with hardly any claw. Stamens 8. Flowers yellow, purple or white.

= = *Flowers regular and symmetrical, but often without petals: the calyx-tube not in the least extended beyond the broad summit of the ovary, on which the green lobes mostly persist: style usually short: stigma capitate.*

8. JUSSIÆA. Stamens twice as many as the lobes of the calyx, petals, and cells of the pod: i. e. 8 or 10, rarely 12.

9. LUDWIGIA. Stamens as many as the lobes of the calyx and cells of the pod, almost always 4. Petals 4, often small, or none.

= = = *Flowers irregular and unsymmetrical: calyx-tube not extended.*

10. LOPEZIA. Flowers small. Calyx with 4 linear purplish lobes. Petals with claws, 4, turned towards the upper side of the flower, the two uppermost narrower and with a callous gland on the summit of the claw, and what seems to be a fifth small one (but is a sterile stamen transformed into a petal) stands before the lower lobe of the calyx. Fertile stamen only one with an oblong anther. Style slender: stigma entire. Pod globular.

+– +– *Shrubs: fruit a 4-celled berry.*

11. FUCHSIA. Flowers showy; the tube of the highly colored calyx extended much beyond the ovary, bell-shaped, funnel-shaped, or tubular, the 4 lobes spreading. Petals 4. Stamens 8. Style long and thread-shaped: stigma club-shaped or capitate.

1. CIRCÆA, ENCHANTER'S NIGHTSHADE. (Named from *Circe,* the enchantress, it is not obvious why; the plants are insignificant and inert, natives of damp woods, flowering in summer.) ♃

C. Lutetiàna, the common species, is 1° – 2° high, branching, with ovate and slightly toothed leaves, no bracts under the pedicels, the rounded little fruit 2-celled and beset with bristly hairs.

C. alpina, common only N. or in mountainous regions, smooth and delicate, 3′ – 6′ high, with thin and heart-shaped coarsely toothed leaves, minute bracts, and obovate or club-shaped fruit 1-celled and soft-hairy.

2. GAÙRA. (Name in Greek means *superb*, which these plants are not; only one of them is worth cultivating.) Fl. all summer.

G. Lindheimèri, of Texas, cult. for ornament, nearly hardy N., about 3° high, hairy, with lanceolate sparingly toothed leaves, long weak branches producing a continued succession of handsome white flowers; the calyx hairy outside; petals nearly 1′ long. 2

G. biénnis, the common wild species, 3°–8° high, soft-hairy or downy, with oblong-lanceolate obscurely toothed leaves, small white or flesh-colored flowers, and downy fruit. ②

3. EPILÒBIUM, WILLOW-HERB. (Name compounded of three Greek words, meaning *violet on a pod.*) Fl. summer. The pods opening give to the winds great numbers of the downy-tufted seeds. 2

§ 1. *Flowers large and showy, in a long spike or raceme, the widely spreading petals on short claws, the stamens and long style bent downwards, and the stigma of 4 long lobes: leaves alternate.*

E. angustifòlium, GREAT W. or FIRE-WEED. One of the plants that spring up abundantly, everywhere northward, where forests have been newly cleared and the ground burned over: tall (4°–7° high) and simple-stemmed, smooth, with lanceolate leaves, and a long succession of pink-purple flowers.

§ 2. *Flowers small in corymbs or panicles terminating the branches, with petals, stamens, and style erect, a club-shaped stigma, and all the lower leaves opposite: stem 1°–2° high.*

E. coloràtum. Almost everywhere in wet places, fl. through late summer and autumn, nearly smooth; with thin lance-oblong leaves generally with purple veins, and purplish petals deeply notched at the end and a little longer than the calyx.

E. mólle. In bogs N., less common, soft downy all over; leaves crowded, linear-oblong, blunt; petals rose-color, notched, 2″–3″ long.

E. palústre. In wet bogs N., slender, minutely hoary all over; leaves linear or lance-linear, nearly entire; petals purplish or white, small.

4. ZAUSCHNÈRIA. (Named for *Zauschner*, a Bohemian botanist.) 2

Z. Califórnica. Cult. for ornament, from California, flowering through late summer and autumn, 1°–2° high, the oval or lanceolate leaves and the pods with downy-tufted seeds resembling those of Epilobium; but the handsome scarlet flowers more like those of a Fuchsia: these are single and sessile in the axils of the upper and alternate leaves, or at length somewhat racemed, about 2′ long.

5. CLÁRKIA. (Named for *Capt. Clark*, who with Capt. Lewis made the first official exploration across the mountains to the Pacific, and brought home one of the species.) Herbs of Oregon and California, with alternate mostly entire leaves, and showy flowers in the upper axils, or the upper running into a loose raceme: cult. for ornament: fl. summer. ①

C. pulchélla. About 1° high, with narrow lance-linear leaves, deeply 3-lobed petals (purple, with rose-colored and white varieties), bearing a pair of minute teeth low down on the slender claw, the lobes of the stigma broad and petal-like. There is a partly double-flowered variety.

C. élegans. Fully 2° high, more commonly flowered in the conservatory, with long branches, lance-ovate or oblong leaves, the lower petioled, lilac-purple entire petals broader than long and much shorter than their naked claw, smaller lobes to the stigma, and a hairy ovary and pod.

6. EUCHARÍDIUM. (Name from the Greek, means *charming.*) ①

E. concínnum, of California, cult. for ornament; a low and branching plant, like a Clarkia in general appearance, except in the long tube to the calyx, and with ovate-oblong entire leaves on slender petioles, and middle-sized rose-purple or white flowers, in summer.

7. ŒNOTHÈRA, EVENING-PRIMROSE. (Name from Greek words for *wine* and *hunt;* application obscure.) Very many species, all originally American, and most of them from the U. S., especially from S. W. and W. The following are the principal common ones, both wild and cult. for ornament: fl. summer. (Pollen-grains loosely connected by cobwebby threads, strongly 3-lobed. See Lessons, p. 103, fig. 316.)

§ 1. *Stigmas* 4, *long and slender, spreading in the form of a cross: tube of the calyx beyond the ovary long and mostly slender.*

* YELLOW-FLOWERED EVENING-PRIMROSES, *properly so-called, the flowers opening (usually suddenly) in evening twilight, and fading away when sunshine returns, odorous; the yellow petals commonly obcordate.*

+ *Stems elongated and leafy: pod cylindrical or spindle-shaped, sessile.* ① ②

Œ. biénnis, COMMON E. Wild in open grounds, and the large-flowered forms cult. for ornament; erect, 2° – 5° high, hairy or smoothish, with lance-oblong leaves entire or obscurely toothed, flowers at length forming a terminal leafy-bracted spike, and petals obcordate. Runs into several varieties, of which the largest and finest now cultivated is

Var. **Lamarckiàna,** from S. W., which is tall and stout, with corolla 3′ – 4′ in diameter: the sudden opening at dusk very striking.

Œ. rhombipétala. Wild on our western limits; more slender, hoary, 1° – 3° high, the rather small flowers with rhombic ovate and *acute* petals.

Œ. Drummóndii, cult. from Texas; has its stems spreading on the ground, and large flowers, like those of the first, in the upper axils, the lance-ovate leaves, &c. soft-downy.

Œ. sinuàta. Wild from New Jersey S., in sandy ground; low and spreading, hairy, with lance-oblong sinuate or pinnatifid leaves, small flowers in their axils, pale yellow petals turning rose-color in fading, and slender pods.

+ + *Stems short and prostrate or scarcely any: pod short, 4-winged.*

Œ. tríloba. Cult. from Arkansas: leaves pinnatifid and cut, like those of Dandelion, smooth, all in a tuft at the surface of the ground, on the short crown, which in autumn is crowded with the almost woody pyramidal-ovate narrowly 4-winged sessile pods, forming a mass 3′ – 5′ in diameter; flowers rather small, the slender tube of the calyx 4′ – 5′ long, its lobes about as long as the obscurely 3-lobed or notched pale-yellow petals, which turn purplish in fading. ① ②

Œ. Missouriénsis, the greener-leaved form also called Œ. MACROCÁRPA. Cult. from Missouri and Texas; finely hoary or nearly smooth, with many short prostrate stems 2′ – 12′ long from a thick woody root, crowded lanceolate entire leaves, very large and showy flowers in their axils, opening before sunset; the tube of the calyx somewhat enlarging upwards, 6′ – 7′ long; the bright-yellow corolla 4′ – 6′ across; pod with 4 very broad wings. ♃

* * WHITE-FLOWERED EVENING-PRIMROSES, *usually turning rose-colored in fading, some of them opening in the daytime: petals broadly obovate or obcordate: flower-buds commonly nodding.*

Œ. taraxicifòlia (probably a variety of Œ. ACAÙLIS), from Chili: rather hairy, at first stemless, at length forming prostrate stems, with pinnatifid or pinnate leaves, after the manner of Dandelion (as the name denotes), and very large flowers in the axils, tube of calyx 3′ – 4′ long, corolla 3′ – 5′ across, and a woody obovate and sharply 4-angled sessile pod. ②

Œ. speciòsa, Nutt., of Arkansas and Texas, not hardy in cult. N.; pubescent, with erect and branching stems 6′ – 20′ high, lance-oblong cut-toothed leaves, the lower mostly pinnatifid; flowers somewhat racemed at the summit, and opening in the daytime; calyx-tube rather club-shaped and not much longer than the ovary; corolla 3′ – 4′ across; pod club-shaped. ♃

(Œ. MARGINÀTA, a tufted mostly stemless species, with lanceolate and often pinnatifid toothed soft-hairy leaves, and peduncled oblong-cylindrical roughish pods; Œ. TRICHOCÀLYX, soft-hairy, conspicuously so on the calyx, with deeply obcordate petals, long-linear pods with a thicker closely sessile base and smooth seeds; Œ. ALBICAÙLIS, with ascending stems, smooth or slightly hoary,

smaller entire petals, but pods and seeds like the foregoing; and Œ. PINNATÍFIDA, with petals as in Œ. trichocalyx, and similar pods, but with striate and reticulated seeds, — all handsome white-flowered species of Western plains and the Rocky Mountains, — are beginning to be cultivated.)

* * * YELLOW-FLOWERED, DIURNAL, *sometimes called* SUNDROPS, *the blossoms opening in bright sunshine: petals mostly obcordate: stems leafy: leaves obscurely toothed or entire. Wild species of the country, all but the last occasionally cultivated.* ♃

+ *Pod short-oblong or obovate, 4-wing-angled.*

Œ. glaùca. Wild from Virginia and Kentucky near and in the mountains S.: 1°–2° high, smooth, pale and glaucous, leafy to the top; leaves ovate or lance-ovate; corolla 2′ or more in diameter.

+ + *Pod club-shaped, somewhat 4-wing-angled above, and 4 intervening ribs.*

Œ. fruticòsa. Wild in open places: *not* shrubby, as the name would imply, hairy or nearly smooth, with oblong or lanceolate leaves, somewhat corymbed flowers 1½′–2′ in diameter, and short-stalked pods.

Œ. lineàris. Wild from Long Island S. near the coast: pale or somewhat hoary with minute pubescence, with slender and spreading often bushy-branched stems 1′–2′ long, linear or lance-linear leaves, and somewhat corymbed flowers, corolla 1′–1½′ across, and hoary pods tapering into a slender stalk. — A spreading form is cultivated, blooming very freely through the summer.

Œ. pùmila. In fields, &c.: nearly smooth, 5′–12′ high, with mostly simple erect or ascending stem, oblanceolate leaves, and scattered flowers, the corolla less than 1′ across, and pods short-stalked or sessile.

* * * * RED-PURPLE-FL., DIURNAL, *leafy-stemmed: pods club-shaped.* ① ②

Œ. ròsea, from Mexico. Minutely downy, with slender spreading stems 6′–24′ high, ovate or lance-oblong leaves, the lower sometimes rather pinnatifid, and flowers 1′ across in leafy racemes.

§ 2. GODÈTIA. *Stigma with 4 linear or short and broad lobes: tube of the calyx beyond the linear or spindle-shaped ovary inversely conical or funnel-shaped: leafy-stemmed: flowers open by day, scentless: petals broad and fan-shaped or wedge-shaped, the truncate summit generally eroded, lilac-purple, rose-color, or sometimes white: anthers erect on short (the alternate ones on very short) and broadish filaments, curving after opening. All W. American, abounding in Oregon and California, several in the gardens, the following most common.* ①

Œ. purpùrea. Very leafy to the top, rather stout, 6′–10′ high, at length with many short branches; leaves pale, lance-oblong, entire; corolla 1′–1½′ across, purple, with a dark eye; short and broad lobes of stigma dark-colored; pods short and thick, closely sessile, rather conical.

Œ. rubicúnda. Taller, 1°–2° high, and linear-lanceolate leaves rather scattered along the slender branches; corolla 2′ or more across, lilac-purple with saffron-colored eye (also pale or rose-colored varieties); lobes of stigma oblong, pale; pods thickish, cylindrical, sessile.

Œ. Líndleyi. Erect or spreading, 8′–16′ high, with slender branches, narrow lanceolate leaves; corolla about 2′ across, lilac-purple, with a deeper red-purple spot on the middle of each petal; lobes of the stigma linear and pale; pods slender, linear, somewhat tapering at the ends.

Œ. amœna. Slender, 6′–18′ high, with lance-oblong or lance-linear leaves, and corolla 2′–3′ across, rose-color or almost white, with usually a deeper reddish eye; lobes of stigma linear; pods linear.

8. JUSSIÆA. (Named for *Bernard,* the elder *de Jussieu.*) Leaves entire. Flowers yellow, all summer.

J. decúrrens. Wet grounds, Virg. to Ill. and S. Erect stems and slender branches margined or winged in lines proceeding from the bases of the lanceolate leaves, smooth throughout; flowers sessile or short-stalked, with 4 lobes of calyx nearly as long as the petals, and oblong-club-shaped 4-angled pod. ① ♃

J. grandiflòra. Marshes S.: hairy, with stems erect from a creeping base, lanceolate acute leaves, flowers 2′ in diameter, the 5 calyx lobes only half as long as the petals, and pods cylindrical and stalked. ♃

J. rèpens. In water from S. Ill. S.: smooth, with creeping or floating and rooting stems, oblong leaves tapering into a slender petiole, long-peduncled flowers 1′ or more across, with 5 calyx-lobes, the cylindrical or club-shaped pods tapering at the base. ♃

9. LUDWÍGIA, FALSE LOOSESTRIFE. (Named for *C. G. Ludwig*, a German botanist, rather earlier than Linnæus.) Marsh herbs, with entire leaves; flowers seldom handsome, in summer and autumn. ♃

§ 1. *Leaves alternate, mostly sessile.*

* *Flowers peduncled in the upper axils, with yellow petals (about ½′ long) equalling the leaf-like ovate or lance-ovate calyx-lobes: stamens and styles slender: pod cubical, strongly 4-angled, opening by a hole at the top: stems 2°–3° high.*

L. alternifòlia. Common E., the only one found far N.: smoothish, branching, with lanceolate leaves tapering to both ends, petals scarcely longer than calyx, and angles of pod wing-margined.

L. virgàta. Pine barrens S.: downy, with mostly simple stems, blunt oblong leaves or the upper linear and smaller, and petals twice the length of the reflexed calyx.

L. hirtélla. Pine-barrens from New Jersey S.: hairy, with simple stems, oblong or lanceolate short and blunt leaves, and petals twice as long as the barely spreading calyx-lobes.

* * *Flowers sessile in the upper axils, small, and with pale yellow petals about the length of the persistent calyx-lobes: stamens and style short: leaves on flowering stems narrow and linear.*

L. lineàris. Swamps from N. Jersey S.: smooth, loosely branched, 1°–3° high, with acute leaves on the flowering stems, but obovate ones on creeping runners; pods oblong-clubshaped or top-shaped and much longer than the triangular-ovate calyx-lobes.

L. linifòlia, only S., is 6′–12′ high, with blunter leaves, and cylindrical pods little longer than the lanceolate calyx-lobes.

* * * *Flowers sessile, often clustered, and with no petals, or rarely mere rudiments: leaves mostly lanceolate, some species with obovate or spatulate leaves on creeping runners: flowering stems mostly 2°–3° high.*

+– *Downy all over: flowers spiked or crowded at the end of the branches.*

L. pilòsa. Only S.: much branched, with lance-oblong leaves, and globular-4-sided pod about the length of the spreading calyx-lobes.

+– +– *Smooth or smoothish throughout.*

L. cylíndrica. From Illinois and N. Car. S.: much branched, with long lanceolate and acute leaves tapering into a petiole, small axillary flowers, and cylindrical pods much longer than the small calyx-lobes.

L. sphærocárpa. From E. New England S.: with lanceolate or linear leaves acute at both ends, very small flowers in the axils, and globular pods not longer than the calyx-lobes, with hardly any bractlets at their base.

L. polycárpa. From Michigan S.: like the last, but smoother, and with conspicuous slender bractlets at the base of the 4-sided rather top-shaped pod, which is longer than the calyx-lobes.

L. capitàta. From N. Carolina S.: with slender simple stems angled towards the top, long lanceolate leaves; flowers mostly crowded in an oblong or roundish terminal head, and obtusely 4-angled pod longer than the calyx-lobes.

L. alàta. From N. Carolina S.: with simple or sparingly branched stems strongly angled above, few flowers, in the axils of the upper wedge-lanceolate leaves, and an inversely pyramidal pod as long as the white calyx-lobes, with concave sides and winged angles.

L. microcárpa. From N. Carolina S.: the low stems creeping at base and 3-angled above, leaves spatulate or obovate, with minute flowers in their axils, the short 4-angled pods not larger than a pin's head.

§ 2. *Leaves opposite, obovate or spatulate, long-petioled, with small and nearly sessile flowers in their axils: stems creeping or floating.*

L. palústris. Common in ditches and shallow water: smooth, with no petals, or small and reddish ones when the plant grows out of water, and oblong obscurely 4-sided pods longer than the very short calyx-lobes.

L. nàtans. From N. Carolina S.: larger than the foregoing, and with yellow petals as long as the calyx-lobes, the pods tapering to the base.

§ 3. *Leaves opposite, nearly sessile, with a long-peduncled flower in the axil of some of the upper ones: stems creeping in the mud.*

L. arcuàta. From coast of Virginia S.: a small and smooth delicate plant, with oblanceolate leaves shorter than the peduncle, yellow petals longer than the slender calyx-lobes, and club-shaped somewhat curved pod.

10. LOPÈZIA. (Named for *T. Lopez*, an early Spanish naturalist.)

L. racemòsa. Cult. sparingly, from Mexico: a slender, branching, nearly smooth plant, with alternate ovate or lance-oblong leaves on slender petioles, the branches terminated with loose racemes of small rose-pink or sometimes white flowers (only $\frac{1}{4}'$ in diameter), on slender pedicels from the axil of leafy bracts, produced all summer, followed by very small round pods. ①

11. FÙCHSIA. (Named for *L. Fuchs*, an early German botanist.) Well-known ornamental tender shrubby plants, or even trees, chiefly natives of the Andes from Mexico to Fuegia, mostly smooth, with opposite or ternately whorled leaves. The species in cultivation, now greatly mixed and varied, chiefly come from the following.

§ 1. Short-flowered Fuchsias, or Ladies' Eardrops; *with the lobes of the normally red calyx longer than the tube and than the petals; the latter normally violet or blue, obovate and retuse, convolute around the base of the projecting filaments and still longer style: flowers hanging on long peduncles from the axils of the leaves.*

F. coccínea, or F. globòsa. Low, the rather small scarlet flowers with globular or ovoid calyx-tube between the ovary and the lobes, which also form a globular bud and hardly spread after opening; leaves short-petioled.

F. Magellánica, from S. Chili and Fuegia: less tender, with tube of the calyx bell-shaped and much shorter than the lobes; leaves short-petioled or the upper sessile.

F. macrostémma, from Chili: leaves on slender petioles; calyx-tube oblong or short-cylindrical, more or less shorter than the spreading lobes. — These species now greatly varied in color; some varieties with calyx white or light and the petals deeply colored, some with the reverse; also double-flowered, the petals being multiplied.

§ 2. Long-flowered Fuchsias; *with trumpet-shaped or slightly funnel-shaped tube of the calyx 2′ – 3′ long, very much longer than the spreading lobes, which little exceed the acute or pointed somewhat spreading petals: stamens and style little projecting: flowers crowded into a rather close drooping raceme or corymb at the end of the branches: leaves large, 5′ – 7′ long.*

F. fúlgens, from Mexico: smooth, with ovate somewhat heart-shaped leaves, and scarlet flowers, the lance-ovate calyx-lobes often tinged with green.

F. corymbiflòra, from Peru: mostly pubescent, with lance-oblong and taper-pointed almost entire leaves, and red flowers, the lanceolate calyx-lobes and the lance-oblong petals taper-pointed, at length widely spreading.

§ 3. Panicled Fuchsias; *with small flowers erect in a naked and compound terminal panicle or cluster: lobes of the calyx and petals widely spreading.*

F. arboréscens, Tree F., from Mexico: a stout shrub rather than tree, with oblong or lance-oblong entire leaves acute at both ends and usually whorled; flowers light rose-color, $\frac{1}{2}'$ long, with narrow oblong calyx-lobes, and petals rather longer than the tube, about as long as the stamens and style.

45. MELASTOMACEÆ, MELÀSTOMA FAMILY.

Plants with opposite and simple 3 – 7-ribbed leaves, no stipules, as many or twice as many stamens as petals, both inserted in the throat of the calyx, anthers usually of peculiar shape and opening by a small hole at the apex. Flowers usually handsome, but mostly scentless. A large order in the tropics, represented in northern temperate regions only by the genus Rhexia of the Atlantic States. None in common cultivation, but the following are those more usually met with in choice conservatories: —

Centradènia ròsea, from Mexico: a low and bushy almost herbaceous plant, with unequal-sided and falcate broadly lanceolate leaves, apparently *alternate* (which comes from the diminution or total suppression of one leaf of each pair), producing great abundance of small flowers in short raceme-like clusters, with 4 white and rose-tinged petals, and 8 anthers with curious club-shaped and tail-like appendages.

Heterocéntron ròseum, from Mexico: an herb, or nearly so, with thin ovate leaves which are *feather-veined* rather than ribbed, and with terminal panicles of handsome bright rose-colored flowers (and a white variety), of 4 petals and 8 very unequal and dissimilar stamens, some with appendages at base, some without.

Cyanophýllum metállicum, from Central America, cultivated in hothouses for its magnificent foliage; the ovate leaves sometimes fully two feet long, purple beneath and bluish above with metallic lustre. — Then we have the U. S. genus,

1. RHÉXIA, DEER-GRASS, MEADOW-BEAUTY. (Name from Greek for *rupture:* application obscure.) Low erect herbs of wet or sandy ground, commoner S., often bristly, at least on the margins of the sessile 3 – 5-ribbed leaves, with handsome flowers in a terminal cyme or panicle. Tube of the calyx urn-shaped, adherent to the lower part of the 4-celled ovary and continued beyond it into a short 4-toothed cup, persistent. Petals 4, obovate. Stamens 8, with anthers opening by a single minute hole. Style slender: stigma simple. Seeds numerous in the pod, coiled like minute snail-shells. Fl. summer. ♃

* *Anthers linear and curved, with a sac-like base and usually a minute spur: flowers in a panicle or loose cyme.*

R. Virgínica. The common species N., in sandy swamps: 6′ – 20′ high, with square stem almost winged at the angles, ovate or lance-oval sessile leaves, and large pink-purple flowers.

R. Mariàna. From New Jersey and Kentucky S.: 10′ – 24′ high, with terete or 6-angled branching stem, linear or lance-oblong leaves narrowed at base, and paler purple flowers hairy outside.

R. glabélla. Pine-barrens S.: smooth, with a simple slender stem, lanceolate glaucous leaves, and large bright-purple flowers.

* * *Anthers oblong and straight, destitute of any appendage.*

+ *Flowers purple, few or solitary: leaves small (rarely 1′ long), rounded-ovate, ciliate with long bristles: stem square, smooth.*

R. ciliòsa. Bogs in pine barrens from Maryland S.: stem 10′ – 12′ high; leaves bristly on the upper face; and calyx smooth.

R. serrulàta. Bogs in pine barrens wholly S.: stem 3′ – 6′ high; leaves smooth above; calyx bristly.

+ + *Flowers yellow, small, numerous, not casting the petals early, as do the others: stem 4-angled, bristly, bushy-branched above.*

R. lùtea. From North Carolina S. & W.: stem 1° high, bristly; leaves lanceolate, or the lower obovate; calyx smooth.

46. MYRTACEÆ, MYRTLE FAMILY.

Trees or shrubs, with simple entire and mostly aromatic leaves punctate with pellucid or resinous dots, no stipules, perfect flowers, calyx-tube adherent to the ovary, its throat, or a disk bordering it, bearing the petals and numerous stamens: style and stigma single. A large family in the tropics and southern hemisphere, here commonly known only by a few house-plants, which may be briefly noted as follows: —

1. **Mýrtus commùnis,** COMMON MYRTLE, from the Mediterranean region: smooth, with ovate or lance-ovate opposite shining leaves, small in the variety usually cultivated, peduncles in their axils bearing a small white or rose-tinged flower (sometimes full double), followed by a black berry, containing several kidney-shaped seeds.
2. **Eugènia Jámbos,** ROSE-APPLE, from India: smooth, with opposite shining long and lanceolate leaves, and clusters of large white flowers with their long stamens most conspicuous; the calyx-tube dilated and prolonged beyond the ovary, which forms a large edible berry, like a small apple, scentless, but when eaten of a rose-like savor; seeds very few, large.
3. **Psídium pyríferum,** GUAVA, of W. Ind.: with oval feather-veined opposite leaves, and one or two white flowers at the end of an axillary peduncle; the fruit a large and pear-shaped yellowish berry which is eatable, and from which *Guava jelly* is made in the West Indies.
4. **Callistèmon lanceolàtum,** of Australia, called BOTTLE-BRUSH, on account of the appearance of the flowers (sessile all round the stem below the later leaves) with their very long deep red stamens; the 5 petals small and falling early; the fruit a small many-seeded pod opening at the top; the alternate lanceolate leaves remarkable for being turned edgewise by a twist at their base, as in many related Myrtaceous plants of Australia.

47. LYTHRACEÆ, LOOSESTRIFE FAMILY.

Differs from the related orders in having the ovary and pod free from, but mostly enclosed in, the tube of the calyx, the leaves not punctate, the anthers opening lengthwise. To this family has lately been appended the Pomegranate, which, although peculiar, is commonly referred to the Myrtle Family, notwithstanding the dotless leaves.

§ 1. *Ovary coherent with the calyx-tube, becoming a fleshy fruit. Small tree.*

1. PUNICA. Calyx-tube colored (scarlet), thick and coriaceous, its top-shaped base coherent with the ovary, above enlarged and 5 – 7-lobed; its throat bearing the 5 – 7 petals and very many incurved stamens. Style slender. Ovary with many cells in two sets, one above the other, and very many ovules in each. Fruit large, globular, crowned with the calyx-lobes, berry-like, but with a hard rind: the numerous seeds coated with a juicy edible pulp.

§ 2. *Ovary free from the calyx-tube, becoming a* 1 – 6*-celled pod.*

* *Stamens indefinitely numerous. Small tree.*

2. LAGERSTRŒMIA. Calyx 6-lobed. Petals 6, very wavy-crisped, raised on slender claws, borne on the throat of the calyx. Stamens borne in the bottom of the calyx, very long and slender, 6 outermost larger than the rest. Style very slender. Pod oblong, thick, many-seeded, 3 – 6-celled, only the base covered by the persistent calyx.

* *Stamens* 4 – 16, *only as many or twice as many as the lobes of the calyx, inserted lower down than the petals. Herbs or nearly so: calyx mostly with projecting folds, or accessory teeth between the proper teeth or lobes.*

+ Flower regular or nearly so: pod many-seeded, included in the calyx.

3. NESÆA. Calyx short bell-shaped or hemispherical. Stamens 10 - 14, twice as many as the petals, in 2 sets, with long projecting filaments. Style slender. Pod globular, 3 - 5-celled. Leaves mostly whorled in threes or opposite.
4. LYTHRUM. Calyx cylindrical, 8 - 12-ribbed or striate. Petals 5 - 7. Stamens 5 - 14. Style slender. Pod oblong, 2-celled. Leaves sessile.
5. AMMANNIA. Calyx short, 4-angled. Petals 4 and small, or none. Stamens 4, short. Pod globular, 2 - 4-celled. Leaves opposite, narrow.

+ + Flower irregular: pod mostly few-seeded.

6. CUPHEA. Calyx elongated, mostly many-ribbed, gibbous, spurred, or with a sac-like projection at base on the upper side, oblique at the mouth, which has 6 proper teeth, and usually as many intermediate accessory ones or processes. Petals mostly 6, with claws, and very unequal, the two upper ones larger; sometimes all or part wanting. Stamens 11 or 12, unequal: filaments short. A gland at the base of the ovary on the upper side. Style slender: stigma 2-lobed. Ovary flat, 2-celled, but one cell smaller and sterile or empty. Pod enclosed in the calyx, and bursting through it on the lower side; the placenta bearing a few flat seeds, hardening, curving, and at length projecting through the rupture.

1. PÙNICA, POMEGRANATE. (The name means *Carthaginian.*)

P. Granàtum. Tree cult. from the Orient, as a house-plant N.: smooth, with small oblong or obovate obtuse leaves, either opposite or scattered, mostly clustered on short branchlets; the flowers short-stalked, usually solitary, large, both calyx and corolla bright scarlet, with 5 - 7 petals, or full double; the fruit as large as a small apple.

2. LAGERSTRŒMIA, CRAPE-MYRTLE. (Named for a Swedish naturalist, *Lagerstræm.*)

L. Índica, from E. Indies: planted for ornament S., and in conservatories N.: shrub with smooth ovate or oval opposite leaves, and panicles of very showy pale rose or flesh-colored large flowers, remarkable for the wavy-crisped petals and long silky-tufted stamens.

3. NESÆA. (Name from Greek for *insular,* from the habitation of the original species.) ♃

N. verticillàta. Common E. and S. in very wet places; smooth or minutely downy, with long recurving branches (2° - 8° long), lanceolate leaves, mostly in threes, the upper with clustered short-stalked flowers in their axils, 5 wedge-lanceolate rose-purple petals, and 10 stamens of two lengths.

N. salicifòlia. Cult. from Mexico, not hardy N.; low, slightly shrubby at base, smooth, erect, with lance-oblong or oblanceolate leaves, the upper ones sometimes alternate, almost sessile flowers in their axils, with mostly 6 obovate yellow petals, and 12 stamens of almost equal length.

4. LÝTHRUM, LOOSESTRIFE. (Name in Greek for *blood:* some have red flowers.) Fl. summer.

L. Salicària, Spiked L. Sparingly wild N. E. in wet meadows, and cult.; with stems 2° - 3° high, leaves broad-lanceolate, and often with a heart-shaped base, in pairs or threes; flowers crowded in their axils and forming a wand-like spike, rather large, with 6 or rarely 7 lance-oblong pink petals, and twice as many stamens of two lengths. ♃

L. alàtum. Low grounds W. & S.: nearly smooth, slender, 2° - 3° high, above and on the branches with margined angles, very leafy; the small leaves oblong, the uppermost not longer than the small flowers in their axils; petals 6, purple; stamens 6. ♃

5. AMMÁNNIA. (Named for *Ammann,* an early German botanist.) Low, insignificant herbs, in wet places, especially S., with small greenish flowers in the axils of the narrow leaves; the inconspicuous petals purplish, or none: fl. all summer.

A. hùmilis, from Mass. to Michigan and S.; has narrow oblanceolate or spatulate leaves, tapering to the base, and a very short style. ①

A. latifòlia. W. & S., taller, the lance-linear leaves with a broader and auricled partly clasping base. ①

6. CÙPHEA. (Name from Greek, means *gibbous* or *curved,* from the shape of the calyx.) Leaves chiefly opposite: fl. all summer.

C. viscosíssima, Clammy C. Sandy fields from Conn. to Ill. and S.: a rather homely herb, 1° – 2° high, branching, clammy-hairy, with lance-ovate leaves, small flowers somewhat racemed along the branches, and ovate pink petals on short claws. ①

C. silenoides. Cult. from Mexico: clammy-hairy, 1° high, with lance-oblong or lanceolate leaves tapering at base into short petiole, and rather large flowers somewhat racemed on the branches; calyx purplish, almost 1′ long, ovoid at base and with a tapering neck; petals blood-purple or crimson, rounded, the 2 larger ½′ in diameter. ①

C. platycéntra. Cult. from Mexico, both in greenhouses and for borders, flowering through the season: slightly woody at base, 8′ – 12′ high, forming masses, thickly beset with the ovate or lance-ovate acute smooth and glossy bright green leaves, contrasting with the bright vermilion flowers between each pair, the calyx narrow and tubular, almost 1′ long, with a short and very blunt spur at base, the short border and teeth dark violet edged on the upper side with white; petals none. 2/

48. LOASACEÆ, LOASA FAMILY.

Herbs with rough pubescence, and some with stinging bristles, no stipules, a 1-celled ovary coherent with the tube of the calyx (which is little if at all extended beyond it), and mostly with 3 – 5 parietal placentæ, in fruit a pod, few – many-seeded: persistent calyx-lobes and true petals mostly 5, and often an additional inner set of petals: stamens commonly numerous, often in 5 clusters: style single. Natives of America, mostly S. & W.: several cult. for ornament.

* *Erect or spreading, not twining: leaves alternate: petals flat.*

1. MENTZELIA. Petals lanceolate, spatulate, or obovate, deciduous. Filaments long and slender, or some of the outermost broadened or petal-like: anthers short and small. Pod top-shaped, club-shaped, or cylindrical, straight. Herbage rough with short stiff pubescence, or bristly, but not stinging.

* * *Twining herbs: leaves opposite, petioled: petals hood-shaped or slipper-shaped.*

2. BLUMENBACHIA. Petals 5, spreading, and as many scale-like small ones or appendages alternate with them. Stamens in 5 sets, one before each petal, with very slender filaments; also 10 sterile filaments, a pair before each appendage. Ovary and many-seeded pod 10-ribbed, when old spirally twisted and splitting lengthwise. Peduncles axillary, mostly 1-flowered. Herbage beset with sharp bristles, commonly stinging like nettles. Flowers on long axillary peduncles.

1. MENTZÈLIA. (Named for *C. Mentzel,* an early German botanist.) Fl. summer or autumn. ① ② Includes the Bartònia of Nuttall and Eucnìde.

§ 1. *Pod 3 – 9-seeded: flowers small, yellow, opening in sunshine.* ① ②

M. oligospérma. Open dry ground, from Illinois S. W.: a rough and homely plant, with spreading brittle branches, ovate and oblong angled or cut-toothed leaves, and yellow flowers less than 1′ broad, with 5 wedge oblong pointed petals, and about 20 slender filaments.

§ 2. Bartònia of Nuttall, &c., not of Muhlenberg. *Pod mostly long, containing many or at least 20 cubical or flat seeds: flowers large and showy: petals 1′ – 2′ long: herbage rough.*

M. Líndleyi. Cultivated, from California, usually under the name of BARTÒNIA AÙREA. Plant 1° – 2° high, with leaves lance-ovate in outline and deeply pinnatifid, their lobes linear; flowers with 5 obovate and pointed bright yellow petals opening in sunshine, and the very numerous filaments all slender. ①

M. ornàta, the BARTÒNIA ORNÀTA of Nuttall, a very large-flowered species, of the plains of Nebraska and S.: 2° – 4° high, with oblong-lanceolate sinuate-pinnatifid leaves, and white fragrant flowers opening at sunset or on a cloudy afternoon, leafy-bracted under the ovary, and with 10 lance-ovate or spatulate acute petals, about 2′ long, the 5 inner narrower, and the 200 – 300 filaments all slender; seeds very many and flat. Rarely cult. for ornament, but well worthy of it. ② ♃?

M. nùda, the BARTÒNIA NÙDA of Nuttall, of the same district and further south, and less rare in cultivation than M. ornata, resembles it, but has flowers of half the size and often without leafy bracts under the ovary; outer filaments mostly broadened; seeds wing-margined. ② ♃?

§ 3. EUCNÌDE of Zuccarini *Pod short, containing very many minute roundish or oblong seeds: flowers showy, yellow, opening in bright sunshine.*

M. lóngipes. Cult. from Mexico and Texas under the name of EUCNÌDE BARTONIOÌDES; a tender succulent plant, branching and usually spreading on the ground, bristly, with ovate cut-toothed or slightly lobed leaves on slender petioles, and flowers mostly on still longer simple peduncles (3′ – 6′ long), the 5 ovate petals and very many slender filaments fully 1′ long. ①

2. BLUMENBÁCHIA. (Named for the distinguished German physiologist, *Blumenbach*. Includes CAIÓPHORA. Fl. all summer.

B. insígnis. Cult. from Chili; rather curious than ornamental, with palmately about 5-parted leaves, small flowers with white petals and yellow red-tipped inner appendages; the pod obovate, slightly twisted, with 5 strongly projecting placentæ. ①

B. laterítia. Cult. from South America, under the name of LOÀSA or CAIÓPHORA LATERÍTIA; climbing freely; with pinnatifid or pinnate leaves of 5 or more lance-ovate divisions or leaflets, which are cut-toothed or some of them again pinnatifid; flowers almost 2′ across, with brick-red petals; the long pod at length much twisted. ①

49. CACTACEÆ, CACTUS FAMILY.

Fleshy plants of peculiar aspect, mostly persistent, destitute of foliage (with exception of the rare Pereskia), its place supplied by the green rind of the flattened, columnar, globular, or various-shaped stem; the perfect solitary and sessile flower with calyx adherent to the ovary, its lobes or sepals, the petals, and the stamens numerous, usually in several ranks, the latter mostly very numerous; ovary 1-celled with several parietal placentæ; style single, with several stigmas; the fruit a 1-celled and generally many-seeded pulpy berry. (See Lessons, p. 48, fig. 111, and p. 84, fig. 229.)

We have three or four wild species, several others in common house-cultivation, and a larger number in choice collections, some of which are hybrids.

§ 1. *No tube to the flower above the ovary: stem jointed.*

1. OPUNTIA. Stem branching, formed of successive joints, which are mostly flat, bearing at first some minute awl-shaped bodies answering to leaves, which soon fall off, and tufts of barbed bristles and often prickles also in their axils. Flowers from the edge or side of a joint, opening in sunshine and for more than one day.

§ 2. *Tube formed of the united sepals, &c. more or less extended beyond the ovary.*

* *Stems and branches of flat and leaf-like joints, with the margins more or less toothed or crenate, and with an evident woody centre or midrib, with no prickles and no bristles, or only tufts of very short ones in the notches.*

2. EPIPHYLLUM. Joints of the branches short and truncate, very smooth, and flowering from the end. Flowers open in the daytime and for several days, mostly oblique, the tube not much lengthened; the sepals and petals rose-red, rather few, the innermost and larger ones about 8. Stamens not very many. Stigmas erect or conniving.
3. PHYLLOCACTUS. Leaf-like branches or joints long, arising from the side of older ones, which with age form terete stems. Flowers from the marginal notches, slightly if at all irregular. Stigmas slender and spreading.

* * *Stems or branches 3 – many-angled or grooved, or terete, and with tubercles or woolly tufts bearing a cluster of spines, prickles, or bristles.*

4. CEREUS. Stem mostly elongated, rarely globular, regularly ribbed or angled lengthwise, and with the clusters of spines or bristles on the ridges one above the other. Flowers from the side of the stem, commonly with a conspicuous tube, which, with the ovary below, is beset with scale-like sepals and generally with woolly or bristly tufts in their axils. Petals numerous and spreading.
5. ECHINOCACTUS. Stem globular, depressed, or sometimes oblong-club-shaped, with many ribs or ridges bearing clusters of spines one above the other. Flowers naked at the summit of the ridges, and with a short or very short tube: otherwise as in Cereus.
6. MELOCACTUS. Stem globular with a broad base, or conical, with many ribs bearing clusters of spines as in Echinocactus; but the flowers small and immersed in a woolly cylindrical muff-like mass at the summit. Sepals and petals united in a cylindrical tube, which is often swollen at the base. Filaments short. Ovary and berry not scaly.
7. MAMILLARIA. Stems globular or cylindrical, mostly tufted, not ribbed, covered with distinct and strongly projecting nipple-shaped tubercles, which are arranged in spiral order and tipped with a cluster of prickles. Flowers from the axils of the tubercles, with a short tube. Ovary and berry not scaly.

1. OPÚNTIA, PRICKLY-PEAR CACTUS, INDIAN FIG, &c. (An ancient name, transferred to these American plants.) Fl. summer. Fruit often eatable.

§ 1. *Stamens not longer than the roundish, in ours yellow, widely opening petals.*

* *Low, prostrate or spreading, native species, also cultivated.*

O. vulgàris, COMMON PRICKLY-PEAR. On rocks and sand, from coast of New England S., with pale and rounded-obovate flat joints, 3′ – 6′ long, bearing minute appressed leaves, having bristles but hardly any spines in their axils, and a nearly smooth eatable berry.

O. Rafinésquii. Common W. & S. W.: deeper green, with joints 4′ – 8′ long, the little leaves spreading, several small spines and a single stronger one in the clusters, and flower often with a reddish centre.

O. Missouriénsis. From Wisconsin W. on the plains: with obovate joints 2′ – 4′ long and tubercled, tufts of straw-colored bristles and 5 – 10 long and slender spines; the berry dry and prickly.

O. Pes-Córvi. On the coast S., with small and narrow, almost cylindrical, easily separable joints, their spines in pairs; the berry small and bristly.

* * *Erect, shrubby or tree-like, cultivated in conservatories, from West Indies and South America: berry edible.*

O. Ficus-Índica. Joints obovate, thick and heavy, 1° long, with minute spines or none; berry obovate, bristly.

O. Tùna. Joints oval, 4′ – 8′ long, with several unequal spines in the tufts, the longer ones about 1′ long.

O. Brasiliénsis. Tree-like, with a round straight trunk rising 10° or more high, bearing short branches, their ultimate joints obovate or oblong, sinuate, thinner and more leaf-like than in the others, armed with single long and very sharp spines.

§ 2. *Stamens longer than the erect crimson petals, shorter than the style.*

O. coccinellífera. Cult. from Mexico and West Indies: tree-like, 6° – 10° high, with joints of the branches obovate-oblong, 4′ – 12′ long, spineless or nearly so, when young with single recurved spines, pale; berry red. One of the plants upon which the cochineal insect feeds, whence the name.

2. EPIPHÝLLUM. (Name from Greek, meaning *upon a leaf*, i. e. the flower from the top of what seems to be a leaf.) Fl. usually in summer.

E. truncàtum. Cult. from Brazil: low, bright green, with drooping branches; the oblong joints scarcely 2′ long, the upper end with a shallow notch; flower 2′ – 3′ long, oblique, with petals and short sepals spreading or recurved, the former so arranged that the blossom often appears as if 2-lipped.

3. PHYLLOCÁCTUS. (From Greek words meaning *Leaf-Cactus.*) Cult. from South America and Mexico: fl. summer.

* *Flower with tube shorter than the petals, red, scentless, open through more than one day: petals and stamens many, except in the first species.*

P. bifórmis. The least showy species; with slender stems, and two sorts of branches, one ovate or oblong, the other lanceolate; the latter producing a slender pink flower, 2′ long, with about 4 slender sepals, as many narrow lanceolate erect petals with spreading tips, and only 8 – 16 stamens.

P. phyllanthoides. Has narrow-oblong sinuate-toothed leaf-like branches, numerous rose-colored oblong and similar sepals and petals, the outermost widely spreading, the innermost erect.

P. Ackermánni. Like the preceding, but much more showy, with bright red and sharp-pointed petals spreading and 2′ – 3′ long, and the scattered sepals small and bract-like.

* * *Flower sweet-scented, with tube 4′ – 10′ long, bearing scattered and small scaly sepals or bracts, which are considerably longer than the numerous spreading white or cream-colored petals.*

P. crenàtus. Leaf-like branches 1° – 2° long, 2′ – 3′ broad, sinuately notched; flower open in the daytime and for several days, 7′ – 8′ in diameter, with the stout tube 4′ – 5′ long, the outer petals or inner sepals brownish.

P. Phyllánthus. Branches nearly as in the preceding; but the flower opening at evening and lasting only till morning, its slender tube many times longer than the small petals.

4. CÈREUS. (Latin name of a *wax-taper* or *candle*, from the form of the stem of some columnar species.) The following are the commonest in cultivation, mostly from Mexico and South America: fl. summer.

§ 1. *Stems and branches long, spreading, creeping or climbing, remotely jointed more or less, only 3 – 7-angled: very large-flowered.*

* *Flower red, open in daytime for several days: stamens much declined.*

C. speciosíssimus. The commonest red-flowered Cactus; with stems 2° – 3° high, rarely rooting, 3 or 4 broad and thin wavy-margined angles or wings, and crimson or red flowers of various shades, 4′ – 5′ in diameter, the tube shorter than the petals. — There are various hybrids of this with others.

* * *Flower white as to petals, opening at night, collapsing next morning, fragrant, 6′ – 9′ in diameter when expanded, the tube 4′ – 5′ long: stems rooting and so climbing: prickles short and fine.* NIGHT-BLOOMING CEREUS.

C. triangulàris has sharply triangular stems, minute prickles, and flower with glabrous tube, olive-green sepals, and yellow stamens.

C. nycticàllus, has 4 – 6-angled stems with very minute prickles, and flower much like the next but with brownish sepals.

C. grandiflòrus, COMMON NIGHT-BLOOMING CEREUS, has terete stems with 5 – 7 slight grooves and blunt angles, bearing more conspicuous prickles, long bristles on the flower-tube, and dull yellow sepals.

§ 2. *Stems and branches long, weak, disposed to trail or creep, remotely jointed, cylindrical, with* 8 – 12 *ribs or grooves and rows of approximated short and fine prickle-clusters: flowers smaller.*

C. serpentìnus. Stems 1′ or more in diameter, tapering at the apex, about 12-ribbed, disposed to stand when short, not rooting; flower opening for a night, fragrant, with linear petals reddish-purple outside, nearly white inside, 2′ long, rather shorter than the tube.

C. flagellifórmis. Stems long and slender, prostrate or hanging and rooting; flower 2′ – 3′ long, the narrow sepals and petals not very many, rose-red, open by day.

§ 3. *Stems erect, self-supporting, tall-growing, cylindrical and column-like, with about* 8 (6 – 10) *obtuse ribs and grooves, short mostly dark-colored prickles* 9 – 12 *in the cluster, and no long bristles: flower large, white; tube* 3′ – 6′ *long.*

* *Flower opening at midday, collapsing before night.*

C. Peruviànus. The largest species (except the Giant Cereus of Arizona), becoming even 40° high and thick in proportion, with rather strong compressed ribs and stout prickles; the flower 6′ long, with greenish sepals and white or externally rose-tinged petals proportionally short. —Var. MONSTRUÒSUS, in old conservatories, has a short stem with 4 – 8 irregular and wavy wing-like angles, sometimes broken up into tubercles.

* * *Flower opening at night, collapsing next day: tall stem narrower at the top.*

C. erióphorus. Stem jointed at intervals, with rounded ridges and needle-like prickles; flower 6′ – 9′ long, with woolly tube, and narrow greenish sepals, the upper 4′ long, longer than the petals.

C. repándus. Stem with flatter ridges, and with flowers much as in the foregoing, but the tube not woolly.

C. cæruléscens. Stem bluish-green, becoming about 3′ thick, with rounded ridges and stoutish prickles; flower 8′ in diameter, with eroded-toothed petals and olive and brown-purple sepals, the longer of these little shorter than the smooth tube.

§ 4. *Stem erect and simple, at length cylindrical, with* 20 – 25 *narrow ridges, bearing clusters of short prickles and long bristly hairs.*

C. senilis, OLD-MAN CACTUS. Cult. for its singular appearance, the long white hanging bristles at the top likened to the locks of an aged man; flowers (seldom seen) not large, with a very short tube.

§ 5. *Stems short and dwarf, globular or oblong, clustered or branching from the base: flower with very short bell-shaped tube.*

C. cæspitòsus. Wild on the plains from Nebraska S.: 3′ – 6′ high, becoming short-cylindrical, with 12 – 18 thick ribs, covered with the close clusters each of 20 – 30 short and widely-spreading prickles; flower rose-purple, in daytime, 2′ – 3′ in diameter.

§ 6. ECHINÓPSIS. *Stem globular or obovate, very proliferous, resembling* Echinocactus, *but flowering from the side; the showy flowers usually open while they last both day and night, and with a long funnel-shaped tube,* 6′ – 8′ *long, to which an outer set of stamens is united up to the throat, while the inner ones are separate far down: petals and sepals pointed.*

* *Flower white, fragrant: calyx-tube with tufts of long brownish wool at each scale: globular stem depressed or sunken at top, about* 3′ *in diameter.*

C. Eyrièsii. Stem with about 13 acute slightly wavy ridges, and many small bristly prickles from woolly tubercles.

C. tubiflòrus, or ZUCCARINIÀNUS. Stem broader than high, sunken at top, with 11 very strong and prominent wavy ridges, the woolly tubercles bearing 6 – 8 stout and dark spines.

* * *Flower delicate rose-color: calyx-tube with scattered hairs and the scales ciliate: stem somewhat pear-shaped or obovate,* 6′ – 12′ *high.*

C. oxýgonus. Stem bluish, with about 14 acute ridges from a broad base, and as many very short and unequal spines in the clusters.

C. múltiplex. Stem green, with about 13 acute ridges and 10 – 12 rather long unequal spines.

5. ECHINOCÁCTUS. (Name means *Spiny* or *Hedgehog Cactus.*) There are many wild species far S. W., but few common in cultivation. Flowers mostly small, opening for 2 or 3 days, closing at night.

E. Texénsis, of S. Texas and Arizona, has stem much broader than high, or globular when young, becoming 1° broad, with 12 – 27 acute wavy ridges, 6 or 7 very stout and horn-like reddish recurved spines; the central one larger and turned down, sometimes 2′ long; flower rose-colored, very woolly, 2′ long.

E. Ottònis, from Brazil, is pear-shaped, becoming club-shaped, 2′ – 3′ thick, with 12 – 14 narrow ridges, clusters of 10 – 14 short slender prickles, and yellow flowers with red stigmas.

6. MELOCÁCTUS, i. e. MELON-CACTUS. One species is often brought from the West Indies, but does not long survive, viz.

M. commùnis, called Turk's-Cap. Globular or ovate, dark green, often 1° high, with 12 – 20 ridges, beset with clusters of short brownish spines; the cylindrical muff-like crown of bristles and cottony wool, 2′ – 5′ high, in which the very small pink flowers are half-imbedded; berries small, red.

7. MAMILLÀRIA. (Name from the nipple-shaped tubercles which cover the stem.) Many wild species far W. and S. W. on the plains: few common in cultivation.

M. longimámma, from Mexico, has the tubercles rising from a depressed body, or apparently almost from the root, 1′ or more long, loosely spreading, much longer than the 8 – 11 prickles at their apex; flowers large for the genus, 1½′ long, yellow.

M. pusílla, wild in Texas and S., with clustered ovate or globular stems 1′ – 2′ long, oblong or ovate tubercles bearing wool in their axils, and tipped with very many capillary crisped bristles and several slender prickles; flowers pink, ½′ long.

M. grácilis, with globular and at length short-cylindrical stems 1′ – 2′ long, excessively proliferous, the oblong tubercles bearing about 16 recurving white prickles, and on older plants 1 or 2 stouter and longer straight ones of a brown hue; flowers small, white.

M. elongàta, with cylindrical clustered stems, covered with short conical tubercles, which bear 16 – 30 uniform radiating and recurving slender prickles in a starry tuft, and very rarely a central one; flowers small, white.

M. vivípara, wild from Nebraska S., 1′ – 5′ high, simple, or proliferous in tufts, globular, with the terete tubercles slightly grooved down the upper side, bearing 12 – 30 rigid widely radiating whitish prickles, and 3 – 12 stouter and darker ones; flower pink-purple, large for the plant, about 2′ in diameter.

50. MESEMBRYANTHEMEÆ, FIG-MARIGOLD FAMILY.

Fleshy plants, of aspect between the Cactus, Purslane, and Orpine Families, with simple entire leaves, and calyx-tube coherent with the compound ovary, which has 4 – 20 styles and as many cells: represented in cultivation by the following.

1. MESEMBRYANTHEMUM. Herbaceous or fleshy-shrubby and prostrate or low branching plants, with very succulent leaves and mostly handsome flowers, opening only in bright light, commonly at noon. Lobes of the calyx mostly 5. Petals (linear) and stamens very numerous, on the calyx. Styles, cells of the ovary, and radiating horns or lobes of the many-seeded pod 4 – 20.
2. TETRAGONIA. Low spreading herbs, with broad and flat thickish leaves, and small flowers in their axils. Calyx usually 4-lobed. Petals none. Stamens few or many. Styles and 1-ovuled cells of the ovary few. Fruit hard and nut-like, 3 – 8-horned, 3 – 8-seeded.

1. MESEMBRYÁNTHEMUM, FIG-MARIGOLD. (Name composed of Greek words signifying *flowering at midday.*) Cult. for ornament, chiefly from S. Africa: fl. summer.

* *Annual or biennial, broad-leaved, prostrate, cultivated in open ground.*

M. crystállinum, Ice-Plant. Plant remarkable for the glittering little excrescences which cover the herbage, like hoar-frost; leaves soft and tender, large, the lower rounded heart-shaped or ovate, upper spatulate, wavy; flowers sessile, white or purplish, $\frac{1}{2}'$ across.

* * *Perennial, somewhat woody-stemmed house-plants, from Cape of Good Hope: leaves all opposite, sessile or connate at base, smooth.*

M. dolabrifórme, Hatchet-leaved F. With glaucous and dotted hatchet-shaped leaves, and yellow flowers opening at evening.

M. acinacifórme, Scymitar-leaved F. With pale 3-sided sabre-shaped leaves (3′ long, fully $\frac{1}{2}'$ wide), flattened branches and peduncle, and pink-purple flower 3′ – 4′ across.

M. spectábile. With glaucous and linear 3-sided pointed leaves, and pink-purple flower 2′ across.

2. TETRAGÒNIA. (Name Greek for *four-angled,* from shape of the fruit.)

T. expánsa, New Zealand Spinach. Occasionally cult. as a Spinach: leaves pale, triangular or rhombic-ovate, with short margined petioles; greenish small flower sessile in the axils; stamens several, in clusters alternate with the 4 lobes of the calyx. ①

51. PASSIFLORACEÆ, PASSION-FLOWER FAMILY.

Represented mainly by the Passion-flowers described below. In conservatories may be found one or two species of Tacsònia, differing from true Passion-flowers in having a long tube to the flower, but they are uncommon, and rarely blossom.

1. PASSIFLÒRA, PASSION-FLOWER. (Flower of the Passion; the early Roman Catholic missionaries in South America finding in them symbols of the crucifixion, the crown of thorns in the fringes of the flower, nails in the styles with their capitate stigmas, hammers to drive them in the stamens, cords in the tendrils.) Herbs or woody plants with alternate leaves and conspicuous stipules, climbing by simple axillary tendrils; the flowers also axillary, usually with 3 bracts underneath, and a joint in the peduncle. Calyx with a very short tube or cup, and 5 divisions which are colored inside like the petals, and often with a claw-like tip. Petals 5 on the throat of the calyx, or sometimes none: within them the conspicuous crown of numerous filaments or rays, forming a double or more compound fringe. Stamens 5, with narrow-oblong versatile anthers: their filaments united in a tube below sheathing and adhering more or less to the long stalk which supports the 1-celled ovary. Styles 3, mostly club-shaped: stigmas capitate. Fruit berry-like, edible in several species, with many seeds, enveloped in pulp, on 3 parietal placentæ. Fl. summer, open for only one day.

* *Wild species of the country, herbaceous, smooth, with 3-lobed leaves.*

P. lùtea. Low grounds, from S. Penn. to Ill. & S.: slender, low-climbing, with the short and blunt lobes of the leaves entire, and a greenish-yellow flower of no beauty, barely 1′ wide. 2/

P. incarnàta, the fruit, called Maypops in S. States, edible, as large as a hen's egg: trailing or low-climbing, with deeply 3-cleft serrate leaves, a pair of glands on the petiole and one or more on the small bracts, the purple crown of the handsome flower (2′ – 3′ across) rather longer than the pale petals. Dry ground, from Virginia and Kentucky S. 2/

* * *Cult. from South America. Stems woody, except the first.* (These are the commoner species: there are a few hybrids and rarer ones.)

+ *Leaves palmately lobed: flower widely spreading.*

P. grácilis. Slender herb, with roundish and slightly 3-lobed otherwise entire leaves, and whitish merely 5-cleft flower only 1′ in diameter, destitute of true petals. Recently introduced, remarkable for the quick movement of its tendrils. ①

P. cærùlea, the COMMON or BLUE PASSION-FLOWER; with leaves very deeply cleft or parted into 5 or 7 lance-oblong entire divisions, pale; and flower almost white, except the purple centre and blue crown banded with whitish in the middle.

P. édulis, GRANADILLA; the purplish edible fruit as large as a goose-egg: leaves dark green and glossy, deeply cleft into 3 ovate pointed lobes beset with callous teeth; bracts under the flower also toothed; the crown crisped, 2′ across, whitish with a blue or violet base, as long as the white petals.

+ + *Leaves entire, feather-veined: flower bell-shaped.*

P. quadrangulàris, LARGE GRANADILLA. Very large, with the branches 4-sided and the angles wing-margined; leaves 4′ – 8′ long, ovate or oval, or slightly heart-shaped, bright green, with 2 – 4 pairs of glands on the petiole; flower about 3′ long, fragrant, crimson-purple and the violet or blue crown variegated with white. Fruit rarely formed here, edible, 6′ long.

52. CUCURBITACEÆ, GOURD FAMILY.

Mostly tendril-bearing herbs, with succulent but not fleshy herbage, watery juice, alternate palmately ribbed and mostly lobed or angled leaves, monœcious or sometimes dicœcious flowers; the calyx coherent with the ovary, corolla more commonly monopetalous, and stamens usually 3, of which one has a 1-celled, the others 2-celled anthers; but the anthers are commonly tortuous and often all combined in a head, and the filaments sometimes all united in a tube or column. Fruit usually fleshy. Embryo large, filling the seed, straight, mostly with flat or leaf-like cotyledons. — Besides those here described, there are occasionally cultivated for curiosity the following annuals: —

MOMÓRDICA ELATÈRIUM or ECBALIUM AGRÉSTE, the SQUIRTING CUCUMBER, a homely hairy herb without tendrils, and producing an oblong hairy pulpy fruit (of violently purgative qualities), which when ripe bursts suddenly at the touch, and discharges the contents with violence (whence the name Ecbalium).

TRICHOSÁNTHES COLUBRÌNA, SNAKE-CUCUMBER or VEGETABLE SERPENT, a tall climber with the staminate flowers ornamental, the lobes of the white corolla being cut into a lace-like fringe of long and very delicate capillary lobes (whence the name of the genus), and the fruit very like a snake, 3 or 4 feet long, green and striped, turning red when ripe.

§ 1. *Flowers large or middle-sized, on separate simple peduncles in the axils: anthers with long and narrow cells, bent up and down or contorted: ovules and seeds many, horizontal, on mostly 3 simple or double placentæ: fruit (of the sort called a pepo) large, fleshy or pulpy with a harder rind.*

* *Both kinds of flowers solitary in the axils.*

1. LAGENARIA. Tendrils 2-forked. Flowers musk-scented, with a funnel-form or bell-shaped calyx-tube, and 5 obcordate or obovate and mucronate white petals; the sterile on a long, the fertile on a shorter peduncle. Anthers lightly cohering with each other. Stigmas 3, each 2-lobed. Fruit with a hard or woody rind and soft flesh. Seeds margined. Petiole bearing a pair of glands at the apex.

2. CUCURBITA. Tendrils 2–5-forked. Flowers large, with a bell-shaped or short funnel-form 5-cleft yellow corolla, its base adherent to the bell-shaped tube of the calyx. Stamens from the bottom of the flower: anthers long-linear, much curved, all three united into a small head. Stigmas 3, each 2-lobed. Fruit fleshy with a firmer rind. Seeds mostly margined.

3. CITRULLUS. Tendrils 2–3-forked. Flowers with a short bell-shaped calyx-tube, and a deeply 5-cleft widely open pale yellow corolla. Stamens with very short filaments: anthers lightly cohering. Stigmas 3, kidney-shaped. Seeds marginless, imbedded in the enlarged pulpy placentæ.

* * *Sterile flowers clustered, fertile ones solitary in the axils.*

4. CUCUMIS. Tendrils simple. Corolla of 5 almost separate acute petals. Stamens separate: anthers with only one bend. Stigmas 3, blunt. Fruit with a fleshy rind. Seeds not margined.

§ 2. *Flowers small, one or both sorts in racemes, panicles, or corymbs.*

* *Ovules and seeds many, horizontal, on 3 placentæ: filaments separate: anthers straightish: tendrils simple: fruit a small berry.*

5. MELOTHRIA. Flowers yellow or greenish, the sterile in small racemes, the fertile solitary on a long and slender peduncle. Corolla open bell-shaped, 5-cleft. Anthers slightly united, soon separate. Fertile flower with calyx-tube constricted above the ovary.

* * *Ovules and seeds* 1–4, *large and vertical: filaments monadelphous: anthers tortuous: tendrils 3-forked: fruit prickly or bristly.*

6. ECHINOCYSTIS. Flowers white, the sterile in compound racemes or panicles, the fertile solitary or in small clusters from the same axils. Corolla wheel-shaped, of 6 narrow petals united at the base. Anthers more or less united in a mass. Style hardly any: stigma broad. Fruit oval or roundish, beset with weak simple prickles, bursting irregularly at the top when ripe; the outer part fleshy under the thin green rind, becoming dry; the inner part a fibrous net-work making 2 oblong cells, each divided at the base into two 1-seeded compartments. Seeds large, blackish, hard-coated, erect from the base of the fruit.

7. SICYOS. Flowers greenish-white, the sterile in corymbs or panicles, the fertile (very small) in a little head on a long peduncle, mostly from the same axils. Corolla nearly wheel-shaped, 5-cleft. Anthers short, united in a little head. Style slender: stigmas 3. Ovary tapering into a narrow neck below the rest of the flower, 1-celled, becoming a dry and indehiscent, ovate or flattish-spindle-shaped, bur-like fruit, beset with stiff and barbed bristles, filled by the single hanging seed.

1. LAGENÀRIA, BOTTLE GOURD. (From the Latin *lagena*, a bottle.)

L. vulgàris, COMMON GOURD, CALABASH. Cult. from Africa and Asia; climbing freely, rather clammy-pubescent and musky-scented, with rounded leaves, long-stalked flowers, white petals greenish-veiny, and fruit of very various shape, usually club-shaped, or long and much enlarged at the apex and slightly at base, the hard rind used for vessels, dippers, &c. ①

2. CUCÚRBITA, PUMPKIN and SQUASH. (Latin name.) The very numerous cultivated forms, strikingly different in their fruit, have been reduced to three botanical species, 1. C. Pepo, 2. C. maxima, 3. C. moschata, which answer to the following sections. These all ①.

§ 1. *Stalks and somewhat lobed leaves rough-bristly, almost prickly: flower-stalks obtusely angled, that of the fruit strongly 5–8-ridged and with intervening deep grooves, usually enlarging next the fruit: hollow interior of the fruit traversed by coarse and separate soft or pulpy threads.*

C. Pèpo, PUMPKIN. Cult., as now along with Indian Corn, by the North American Indians before the coming of the whites; large round fruit mostly yellow, smooth, the flesh not hardening.

C. ovífera, ORANGE-GOURD, EGG-GOURD, &c.: so called from the small, orange-like, egg-shaped or pear-shaped, yellow or white or variegated fruit, used for ornament: wild in Texas, probably the original of all this group.

C. verrucòsa, WARTY, LONG-NECK, and CROOK-NECK SQUASH, VEGETABLE MARROW, &c. Fruit mostly hard-fleshed at maturity, the surface warty, ribbed, or sometimes smooth and even, from 2° to a few inches in length in the very various forms, in a remarkable one 3°–4° long and little thicker than a man's arm.

§ 2. *Stalks and bright green 5–7-lobed leaves pubescent with soft hairs: fruit-stalk 5-ridged, prominently enlarged where it joins the fruit, the central pulp hardly thready.*

C. moschàta, MUSKY, CHINA, or BARBARY SQUASH, &c. Cult. for the edible fruit, which perfects only S., and is club-shaped, pear-shaped, or long-cylindrical, with a glaucous-whitish surface.

§ 3. *Stalks and almost kidney-shaped slightly or obtusely 5-lobed leaves roughish-hairy: flower-stalks terete; that of the fruit thick, many-striate but not ridged and grooved: inner pulp copious and not thready.*

C. máxima, GREAT or WINTER SQUASH, &c. Fruit rounded, depressed, often much wider than high, or (as in OHIO S.) ovate and pointed, usually banded lengthwise, varying from 6′ to 3° in length or breadth, the hard flesh commonly yellow or orange. The crowned or TURBAN SQUASHES have the top of the fruit projecting beyond an encircling line or constriction which marks the margin of the adherent calyx-tube.

3. CITRÚLLUS, WATERMELON. (Name made from *Citrus*, Latin for Orange or Citron.) ①

C. vulgàris, WATERMELON. Cult. from Asia. Prostrate, with leaves deeply 3–5-lobed, and the divisions again lobed or sinuate-pinnatifid, pale or bluish; the refreshing edible pulp of the fruit, in which the dark seeds are imbedded, consists of the enlarged and juicy placentæ, which are reddish or rarely white. — The so-called CITRON of our gardens is a variety with a firm or hard flesh, used for preserving.

4. CÙCUMIS, MELON and CUCUMBER. (The Latin name.) ①

C. Mèlo, MELON, MUSKMELON. Leaves round-heart-shaped or kidney-shaped, the lobes if any and sinuses rounded; fruit with a smooth rind and sweet flesh, the edible part being the inner portion of the pericarp, the thin and watery placentæ being discarded with the seeds. The SERPENT MELON, sometimes called SERPENT-CUCUMBER, is a strange variety, occasionally met with, with a long and snake-like fruit.

C. sativus, CUCUMBER. Leaves more or less lobed, the lobes acute, the middle one more prominent, often pointed; fruit rough or muricate when young, smooth when mature, eaten unripe.

5. MELÒTHRIA. (An ancient Greek name for some sort of grape.) ♃

M. péndula, from Virginia S., is a delicate low climber, with roundish or heart-shaped and 5-angled or lobed roughish leaves, minute flowers, in summer, and oval green berries.

6. ECHINOCÝSTIS, WILD BALSAM-APPLE. (Name from Greek for *hedgehog* and *bladder*.)

E. lobàta. Low grounds, chiefly N. & W., and cult. for arbors: tall-climbing, smoothish, with strongly and sharply 5-lobed leaves, copious and rather pretty white flowers, produced all summer, and oval fruit 2′ long, dry and bladdery after opening; seeds flat. ①

7. SÍCYOS, STAR-CUCUMBER. (Ancient Greek name of Cucumber.)

S. angulàtus. A weed in damp or shady grounds, commoner S., climbing high, clammy-hairy, with roundish heart-shaped and 5-angled or slightly lobed leaves, inconspicuous flowers, and little bur-like fruits beset with deciduous barbed prickles. The tendrils are very active in their movements, and in a warm day coil by a visible motion after contact with a solid body. ①

53. BEGONIACEÆ, BEGONIA FAMILY.

Somewhat succulent herbaceous or more or less woody-stemmed house-plants, of peculiar aspect, with alternate and *unequal-sided* leaves, deciduous stipules, and monœcious flowers, in cymes or clusters on axillary peduncles, numerous stamens, inferior triangular ovary, becoming a many-seeded pod, — represented in choice cultivation by the genus

1. BEGÒNIA, ELEPHANT'S-EAR. (Named for *M. Begon,* Governor of St. Domingo 200 years ago.) Flowers with the calyx and corolla colored alike, sometimes dull but usually handsome, both kinds commonly in the same cyme, and flat in the bud; the outer pieces answering to sepals mostly 2, valvate in the bud; the inner, or true petals, 2, or in the fertile flowers usually 3 or 4, or not rarely wanting; in the sterile flowers surrounding a cluster of numerous stamens with short filaments; in the fertile are 3 styles with thick or lobed stigmas. Ovary and pod triangular, often 3-winged. — These curious plants are remarkable for the readiness with which they may be propagated by leaves used as cuttings. The following are the commonest pure species. There are several rarer ones and many hybrids.

* *Leaves and whole plant smooth and naked: rather tall-growing, leafy-stemmed.*

+ *Leaves ovate-oblong, serrate with bristle-tipped teeth, not at all heart-shaped.*

B. fuchsioìdes, so-called because the bright scarlet flowers, hanging on a slender drooping stalk, may be likened to those of Fuchsia; the crowded and small green and glossy leaves only a little unequal-sided at base.

+ + *Leaves very obliquely heart-shaped or half heart-shaped at base, almost entire.*

B. nítida, with obliquely heart-shaped glossy leaves green both sides, and with large light rose-colored flowers.

B. sanguínea, with large and fleshy obliquely ovate-heart-shaped leaves, having a narrow revolute margin, pale green above, red beneath, as are the stalks; the flowers white, not showy.

B. maculàta, cult. under the name of B. ARGYROSTÍGMA, both names referring to the silvery-white spots scattered over the upper face of the leaves, which are narrower and more oblong than in the preceding, purplish or crimson beneath, the margin cartilaginous but not revolute, the flowers white or flesh-colored.

B. coccínea, with scarlet flowers, as the name denotes, and oblong half heart-shaped leaves glossy above, and green both sides or purple at the margin, which is a little wavy-toothed.

* * *Leaves slightly bristly-hairy above and more so on the sharp teeth: stems elongated, naked, bearing tubers or bulblets in the axils.*

B. Evansiàna (or B. DÍSCOLOR), an old-fashioned species from China, now rare, almost hardy even N., producing all summer showy rose-colored flowers in the open ground; the ovate and heart-shaped pointed leaves not very oblique, red beneath.

* * * *Leaves smooth and naked above, bristle-bearing on the toothed or cut margins and long petioles: stems fleshy, erect or ascending; flowers with the 2 colored sepals, but seldom any petals.*

B. manicàta, a handsome species of the conservatory, remarkable for the purple bristle-bearing scales or fringes on the apex or upper part of the petiole, and similar smaller tufts on the ribs of the lower face of the large and broadly ovate-heart-shaped leaves; flowers small, but numerous and elegant, in an open panicle on a very long naked peduncle, flesh-colored.

B. phyllomaniaca, has the stem thickly beset with leaf-like scales or little adventitious leaves, from which the plant may be propagated, both leafstalks and peduncles bristly, the large leaves ovate-heart-shaped and tapering to a narrow point, their margins cut-toothed, and rather large but not showy flowers.

* * * * *Leaves, or especially the petioles, and the peduncles or scapes, bristly-hairy, these all from a fleshy tuberous or creeping rootstock.*

+– *Leaves large, obliquely heart-shaped, toothed or merely wavy-margined, variously silvered or variegated above, reddish or purple beneath: flowers rather large but not showy: cultivated for their foliage, now much crossed and mixed.*

B. Rex, the most prized and now the commonest species of the group, with the leaf silver-banded or silvery all over the upper face, and smooth pale rose-colored flowers.

B. Griffithii, like the preceding, but leaves and stalks more downy-hairy, and the almost white flowers hairy outside.

B. xanthina, with leaves, &c. much as in the two preceding, but the flowers yellow.

+– +– *Leaves deeply about 7-cleft: flowers with only the 2 sepals, no petals.*

B. heracleifòlia, with rather large and rounded hardly oblique leaves, smooth above and sometimes variegated, the lobes broad lanceolate and cut-toothed, and small pale rose or whitish flowers.

54. UMBELLIFERÆ, PARSLEY FAMILY.

Herbs, some innocent and many of them aromatic, others acrid-narcotic poisons, with small flowers in umbels, calyx adherent to the 2-celled ovary which has a single ovule hanging from the summit of each cell, 5 minute calyx-teeth or none, 5 petals, 5 stamens, and 2 styles; the dry fruit usually splitting into 2 seed-like portions or akenes: seed with hard albumen and a minute embryo. Eryngium and one or two others have the flowers in heads instead of umbels. Stems usually hollow. Leaves alternate, more commonly compound or decompound. Umbels mostly compound: the circle of bracts often present at the base of the general umbel is called the *involucre;* that at the base of an umbellet, the *involucel.*

The flowers being much alike in all, the characters have to be taken from the form of the fruit, and much stress is laid upon the receptacles of aromatic oil (*vittæ* or oil-tubes) which are found in most species and give characteristic flavor. The family is too difficult for the beginner. So that only the common cultivated, and the most conspicuous or noteworthy wild species are given here. For the remainder the student is referred to the Manual, and to Chapman's Southern Flora.

§ 1. *Fruits covered with little scales or tubercles, crowded (as are the flowers) in a head instead of an umbel, and with a pointed scaly bract under each flower.*

1. ERYNGIUM. Flowers blue or white, with evident awl-shaped calyx-teeth, and top-shaped fruit without any ribs. Leaves in our species simple and with bristly or prickly teeth.

§ 2. *Fruits covered with bristly prickles, bur-like: umbels compound.*

2. SANICULA. Flowers greenish or yellowish, so short-stalked or nearly sessile that the umbellets appear like little heads, each with some perfect and fertile and some staminate flowers. Fruits ovoid or globular, not readily splitting in two, not ribbed, completely covered with short hooked prickles. Leaves palmately parted.

3. DAUCUS. Flowers white or cream-color, in a regular compound umbel: the petals unequal, or those of the marginal flowers larger. Prickles in rows on the ribs of the short fruit, which splits in two when ripe. Leaves pinnately compound or decompound.

§ 3. *Fruits naked (not prickly), splitting when ripe and dry into two one-seeded pieces or carpels, each usually with 5 ribs or some of them may be wings.*

* *Umbels simple or sometimes proliferous, one over the other. Leaves simple.*

4. HYDROCOTYLE. Flowers white. Fruit much flattened contrary to the line of junction of the two carpels: no oil-tubes. Leaves rounded.

* * *Umbels compound. Fruits mostly with oil-tubes in the form of lines or stripes, one or more in the intervals between the ribs, and some on the inner face, sometimes also under the ribs.*

+– *Fruit wingless.*

+–+ *Seed concave on the inner face: marginal flowers larger and irregular.*

5. CORIANDRUM. Fruit globular, not readily splitting in two, indistinctly many-ribbed: a pair of large oil-tubes on the inner face of each carpel. Flowers white. Leaves pinnately compound. Plant strong-scented.

+–+ +–+ *Seed deeply grooved down the inner face: flowers all alike, white.*

6. OSMORRHIZA. Fruit long and slender, club-shaped, or tapering at the base. somewhat sweet-aromatic: no obvious oil-tubes. Leaves twice or thrice ternate. Root sweet-aromatic.

7. CONIUM. Fruit short, broadly ovate, rather strong-scented, compressed at the sides, each carpel with 5 strong and more or less wavy ribs: oil-tubes many and minute. Leaves pinnately decompound.

+–+ +–+ +–+ *Seed slightly if at all hollowed out on the inner face.*

8. CICUTA. Fruit globular and contracted on the sides, each carpel with 5 broad and thickened blunt ribs, and an oil-tube in each interval: the slender axis between the carpels splitting in two. Flowers white. Leaves pinnately decompound, not aromatic. Fruit aromatic.

9. SIUM. Fruit globular or short-oblong and contracted on the sides, each carpel with 5 strong or corky ribs, and commonly 2 or more oil-tubes in the narrow intervals. No axis or hardly any left when the carpels separate. Flowers white. Leaves pinnate. Not aromatic.

10. APIUM. Fruit ovate or broader than long, flattened on the sides, each carpel 5-ribbed and a single oil-tube in the intervals: axis left when the carpels separate not splitting in two. Flowers white.

11. CARUM. Fruit ovate or oblong, flattish on the sides; each carpel with 5 narrow ribs, and a single oil-tube in the intervals: the axis from which the carpels separate splitting in two. Flowers mostly white. Leaves decompound. Fruit or foliage aromatic.

12. FŒNICULUM. Fruit oblong; the two carpels with a broad flat face, 5 stout ribs, and a single oil-tube in the intervals between the ribs. Flowers yellow. Leaves decompound: the leaflets slender thread-shaped. Whole plant sweet-aromatic.

+– +– *Fruit winged or wing-margined at the junction of the two carpels, which are flat on the face and flat or flattish and 3-ribbed on the back. Leaves pinnately or ternately compound.*

+–+ *Wing double at the margins of the fruit.*

13. LEVISTICUM. Fruit ovate-oblong, with a pair of thickish marginal wings, and single oil-tube in each interval. Involucre and involucels conspicuous, the bracts of the latter united by their margins. Flowers white. Plant sweet-aromatic.

14. ARCHANGELICA. Fruit ovate or short-oblong, with thin or thickish marginal wings, and many small oil-tubes adherent to the surface of the seed. Involucels of separate mostly small bracts: involucre hardly any. Flowers white or greenish.

+–+ +–+ *Wing surrounding the margin of the fruit single, splitting in two only when the ripe carpels separate.*

15. HERACLEUM. Fruit, including the thin and broad wing, orbicular, very flat, and the three ribs on the back very slender: the single oil-tubes in the intervals reaching from the summit only half-way down. Flowers white, the marginal ones larger and irregular. Leaves ternately compound. Plant strong-scented.

16. PASTINACA. Fruit oval, very flat, thin-winged: the single oil-tubes running from top to bottom. Flowers yellow, the marginal ones not larger. Leaves pinnately compound.

1. ERÝNGIUM, ERYNGO. (Ancient name, of obscure meaning). Fl. in summer.

E. yuccæfòlium, BUTTON-SNAKEROOT. Sandy and mostly damp ground, from New Jersey S. & W.: stout herb, 2° – 3° high, smooth, of aspect quite unlike most Umbelliferous plants, having linear and tapering grass-like leaves, parallel-veined in the manner of an Endogen, and fringed with bristles, a few globular thick heads in place of umbels, a very short involucre, and white flowers. ♃

E. Virginiànum. Wet grounds from New Jersey S.: with lance-linear rather veiny leaves showing some distinction between blade and petiole, the former with rigid teeth, and involucre longer than the bluish heads. ② There are several other species from North Carolina S.

2. SANÍCULA, SANICLE. (Latin name, from *sano*, to heal.) Common in thickets and open woods. Flowers greenish, crowded in small and head-like umbellets, in summer. ♃

S. Canadénsis. Stems 1° – 2° high; leaves thin, palmately 3 – 5-parted into wedge-obovate or oblong sharply cut and toothed divisions, the side ones often 2-lobed; umbellets rather few-flowered, with the sterile flowers in the centre almost sessile; styles shorter than prickles of the bur-like fruit.

S. Marilándica. Stems 2° – 3° high; leaves of firmer texture, with narrower divisions and rigid teeth; umbellets with many flowers, the sterile ones on slender pedicels, fertile ones with long styles.

3. DAÙCUS, CARROT. (Ancient Greek name.) Fl. in summer.

D. Caròta, COMMON C. Cult. from Europe for the root, occasionally run wild: leaves cut into fine divisions; umbel concave and dense in fruit, like a bird's nest; involucre of pinnatifid leaves. ②

4. HYDROCÓTYLE, WATER-PENNYWORT. (From Greek words for *water* and *flat dish*.) Low and small very smooth herbs, growing in water or wet places, mostly with creeping or rooting stems, and simple rounded leaves either kidney-shaped or peltate. Fl. all summer. ♃

* *Leaves peltate from the centre, on long petioles which, as well as the peduncles, rise from slender running rootstocks: fruit sharp-margined.*

H. umbellàta. Along the coast and rivers from Mass. S.: flowers many in the umbel, on slender pedicels; petioles and peduncles 3′ – 8′ high.

H. interrúpta. Same range, smaller than the other, with few flowers on short pedicels in each of the little umbellets growing one above the other to form an interrupted spike.

* * *Leaves not peltate: peduncles and pedicels both short: stems slender, branched.*

H. Americàna. Shady damp places; leaves thin, small, crenate and lobed, on short petioles, with minute flowers in their axils.

There are two larger, long-petioled, but less common species from Pennsylvania S., viz. H. REPÁNDA and H. RANUNCULOÌDES.

5. CORIÁNDRUM, CORIANDER. (Name from Greek word for bug: the herbage has a bedbug-like scent.)

C. sativum. Cult. from the Orient, for the aromatic *coriander-seed*: low, with small umbels of few rays; fl. summer. ①

6. OSMORRHÌZA, SWEET CICELY, not the European plant of that name, which is MÝRRHIS ODORÀTA, with much more sweet-scented fruit. (Name, Greek for *scented root*, the root being sweet-aromatic.) Rich moist woods, common N.: fl. late spring and summer. ♃

O. longístylis, the smoother species, with the sweeter root, has slender styles, and ovate cut-toothed short-pointed leaflets, which are slightly downy.

O. brevístylis, has conical styles not longer than the breadth of the ovary, and downy-hairy taper-pointed almost pinnatifid leaflets.

7. CONÌUM, POISON HEMLOCK. (Greek name of the Hemlock by which criminals and philosophers were put to death at Athens.)

C. maculàtum, SPOTTED H. Waste grounds, run wild, from Eu.: a smooth, branching herb, with spotted stems about 3° high, very compound leaves with lanceolate and pinnatifid leaflets, ill-scented when bruised: a *virulent poison*, used in medicine: fl. summer. ②

8. CICÙTA, WATER-HEMLOCK. (Ancient Latin name of the true Hemlock, transferred to some equally *poisonous* plants.) Fl. summer. ♃

C. maculàta, SPOTTED COWBANE, MUSQUASH-ROOT, BEAVER-POISON, &c. Tall smooth stem sometimes streaked with purple, but seldom really spotted; leaflets lance-oblong, coarsely toothed or sometimes cut-lobed, veiny, the main veins mostly running into the notches; fruit aromatic when bruised; root a *deadly poison*.

9. SÌUM, WATER-PARSNIP. (Old name, of obscure meaning.) ♃

S. lineàre, the common species, in water and wet places: tall, smooth, with grooved-angled stems, simply pinnate leaves, the long leaflets linear or lanceolate, very sharply serrate and taper-pointed, and globular fruit with wing-like corky ribs: fl. all summer. Root and herbage also *poisonous*.

10. ÀPIUM, CELERY, &c. (Old Latin name.) One species cult.: viz.

A. gravèolens. A strong-scented, acrid, if not poisonous plant, of the coast of Europe; of which the var. DÚLCE, GARDEN CELERY, is a state rendered bland and the base of the leafstalks enlarged, succulent and edible when blanched, through long cultivation; leaves pinnately divided into 3 – 7 coarse and wedge-shaped cut or lobed leaflets or divisions; umbels and fruits small. Var. RAPÀCEUM, TURNIP-ROOTED CELERY, is a state with the root enlarged and eatable. ②

11. CÀRUM, CARAWAY, &c. (Name perhaps from the country, *Caria*.)

§ 1. TRUE CARAWAY, *with finely pinnately compound leaves, and white flowers.*

C. Cárui, GARDEN CARAWAY: cult. from Eu., for the *caraway-seed*, the oblong highly aromatic fruit; stem-leaves with slender but short thread-shaped divisions.

§ 2. PARSLEY OR PETROSELÌNUM, *with coarser leaves and greenish flowers.*

C. Petroselìnum (or PETROSELINUM SATÌVUM), PARSLEY: cult. from Eu., especially the curled-leaved state, for the pleasant-flavored foliage, used in cookery, chiefly the root-leaves, which have ovate and wedge-shaped 3-lobed and cut-toothed divisions; fruit ovate. ②

12. FŒNÍCULUM, FENNEL. (Name from the Latin *fœnum*, hay.)

F. vulgàre, COMMON F. Cult. from Eu., for the sweet-aromatic foliage and fruit: stout very smooth herb 4° – 6° high; leaves with very numerous and slender thread-shaped divisions; large umbel with no involucre or involucels; fruit ¼′ or ⅓′ long, in late summer. ♃

13. LEVÍSTICUM, LOVAGE. (Ancient Latin name.) One species.

L. officinàle, GARDEN L. Cult. in old gardens, from Eu.: a tall, very smooth, sweet aromatic herb, with large ternately or pinnately decompound leaves, coarse wedge-oblong and cut or lobed leaflets, a thick root, and small many-flowered umbels. ♃

14. ARCHANGÉLICA. (Genus established on a species of Angelica.) Fl. summer. ♃

A. atropurpùrea, GREAT A. Moist deep soil N.: strong-scented, smooth, with very stout dark-purple stem 3° – 6° high, large leaves ternately compound, and the divisions with 5 – 7 pinnate leaflets, which are ovate and

cut-serrate; petioles with large inflated membranaceous base; flowers greenish-white; fruit smooth and thin-winged.

A. hirsùta. Dry ground, commoner S.: stem 2° – 5° high, rather slender, downy at top, as are the umbels and broadly winged fruits; leaflets thickish, ovate-oblong, serrate; flowers bright white.

15. HERACLÈUM, COW-PARSNIP. (Named after *Hercules.*) Fl. summer. 2

H. lanàtum, DOWNY C., wrongly called MASTERWORT. Damp rich ground N.: very stout, 4° – 8° high, woolly-hairy when young, unpleasantly strong-scented, with large cut and toothed or lobed leaflets, some of them heart-shaped at base, and broad umbels with white flowers and large fruits.

16. PASTINÀCA, PARSNIP. (Latin name, from *pastus*, food.)

P. sativa, COMMON P. Run wild in low meadows, and then rather *poisonous*, cult. from Eu. for the esculent strong-scented root: tall, smooth, with grooved stem, coarse and cut-toothed or lobed leaflets, and umbels of small yellow flowers. ②

55. ARALIACEÆ, GINSENG FAMILY.

Like the foregoing family, but often shrubs or trees, usually more than two styles and cells to the ovary and fruit, the latter a berry or drupe. Besides a few choice and uncommon shrubby house-plants, represented only by the two following genera. The flowers in both are more or less polygamous, and the lobes or margin of the calyx very short or none. Petals and stamens 5.

1. ARALIA. Flowers in simple or panicled umbels, white or greenish: the petals lightly overlapping in the bud. Styles 2 – 5, separate to the base, except in sterile flowers. Leaves compound or decompound. Root, bark, fruit, &c. warm-aromatic or pungent.
2. HEDERA. Flowers in panicled or clustered umbels, greenish: petals valvate in the bud. Ovary 5-celled: the 5 styles united into a conical column. Leaves simple, palmately 3 – 5-lobed or angled. Woody stems climbing by rootlets.

1. ARÀLIA. (Derivation obscure: said to be a Canadian name under which a species was sent from Quebec to the Garden of Plants at Paris.) 2

§ 1. WILD SARSAPARILLA, &c. *Flowers perfect or polygamous with both fertile and sterile on the same plant: umbels more than one: fruit black or dark purple, spicy: seeds or cells and styles* 5.

* *Large and leafy-stemmed, with very compound leaves sometimes* 2° *or* 3° *across, and with many umbels in a large compound panicle: fl. in summer.*

A. spinòsa, ANGELICA TREE, HERCULES' CLUB. River-banks from Penn. S., and planted: a shrub or low tree, of peculiar aspect, the simple stout trunk rising 6° – 20° high and beset with prickles, bearing immense leaves with ovate serrate leaflets, and corymbed or panicled umbels.

A. racemòsa, SPIKENARD. Woodlands in rich soil, with herbaceous stems 3° – 5° high from a thick aromatic root, not prickly, widely spreading branches, heart-ovate leaflets doubly serrate and slightly downy, and racemed-panicled-umbels.

* * *Smaller: short stems scarcely woody at base: few umbels: fl. early summer.*

A. hìspida, BRISTLY SARSAPARILLA. Rocky places: bristly stems 1° – 2° high, leafy below, naked and bearing corymbed umbels above; leaves twice pinnate, the leaflets oblong-ovate and cut-toothed.

A. nudicaùlis, COMMON WILD S. Low ground: the aromatic horizontal slender roots running 3° – 5° long, used as a substitute for officinal Sarsaparilla; the smooth proper stem rising only 2′ – 4′ inches, bearing a single long-stalked

leaf of 5 ovate or oval serrate leaflets on each of the 3 divisions of the petiole, and a short peduncle with 2 – 7 umbels.

§ 2. GINSENG. *Sterile and fertile flowers on separate simple-stemmed plants, in a single slender-stalked umbel, below it a single whorl of digitate leaves: styles and cells of the fruit* 2 *or* 3.

A. quinquefòlia, GINSENG. Rich woods N.: root spindle-shaped, warm-aromatic, 4′ – 9′ long; stem 1° high; leaflets 5 at the end of each of the 3 petioles, slender-stalked, thin, obovate-oblong, pointed, serrate; fl. in summer; fruit red.

A. trifòlia, DWARF G. or GROUND-NUT. Low woods, N.: 4′ – 8′ high from a deep globular pungent-tasted root; leaflets 3 or sometimes 5 sessile on the end of each of the 3 petioles, narrow-oblong and obtuse: fl. in spring; fruit orange-yellow.

2. HÉDERA, IVY. (The ancient Latin name.) Fl. late summer.

H. Hèlix, TRUE or ENGLISH IVY, from Europe. Woody climber, with evergreen glossy rounded heart-shaped or kidney-shaped and 3-lobed or 3-angled leaves, or in some varieties more deeply 3 – 7-cleft, yellowish-green flowers, and blackish berries; covers shaded walls, &c., adhering by its rootlets, but scarcely stands far N. without some protection.

56. CORNACEÆ, DOGWOOD FAMILY.

Shrubs, trees, or one or two mere herbs, with simple leaves, small flowers, calyx-tube in the perfect or pistillate ones coherent with the surface of the 1 – 2-celled ovary, which is crowned with the small calyx-teeth or minute cup, bearing the petals (valvate in the bud) and stamens of the same number: style and stigma single: ovule and seed solitary in the cells, hanging from the summit: fruit a small drupe or berry.

GÁRRYA ELLIPTICA, a singular Californian shrub, with thick opposite leaves, and dicœcious greenish flowers in hanging catkin-like spikes, is rarely cultivated or planted.

1. CORNUS. Flowers perfect, in cymes, close clusters, or heads (with or without a corolla-like involucre). Minute teeth of the calyx, petals, and stamens 4. Style slender: stigma terminal. Berry-like little drupe with a 2-celled 2-seeded stone. Leaves entire, opposite except in one species, deciduous. Bark very bitter, tonic.
2. AUCUBA. Flowers dicœcious, dull purple, in axillary panicles. Teeth or lobes of the calyx and petals 4. Stamens in the sterile flowers 4, with short filaments and oblong anthers. Fertile flowers with a 1-celled ovary, becoming an oblong red berry in fruit: style short: stigma capitate. Leaves opposite, coriaceous and glossy, evergreen, smooth, more or less toothed.
3. NYSSA. Flowers polygamous or dicœcious, greenish, crowded or clustered on the summit of an axillary peduncle, the sterile ones numerous, the fertile 2 – 8 in a bracted cluster, or rarely solitary. Calyx of 5 or more lobes or teeth. Petals small and narrow, or minute, or none. Style slender or awl-shaped, bearing a stigma down the whole length of one side, revolute. Ovary and stone of the drupe 1-celled and 1-seeded. Trees, with deciduous alternate leaves, often crowded on the end of the branchlets, either entire, angled, or few-toothed.

1. CÓRNUS, CORNEL or DOGWOOD. (Name from *cornu*, horn, from the hardness of the wood.) Fl. late spring and early summer.

§ 1. *Flowers greenish, crowded in a head or close cluster, which is surrounded by a showy corolla-like (white or rarely pinkish)* 4*-leaved involucre: fruit bright red.*

C. Canadénsis, DWARF CORNEL, BUNCH-BERRY. Damp woods N.: a low herb, the stems springing from creeping slender subterranean shoots

which are slightly woody, bearing 4 – 6 ovate or oval leaves at the summit, as if in a whorl, below the stalked flower-head; petal-like leaves of the involucre ovate; fruits globular, in a cluster, rather eatable.

C. flórida, Flowering Dogwood. Rocky woods, also planted for ornament: tree 12° – 30° high, with ovate pointed leaves, petal-like leaves of the involucre ($1\frac{1}{2}'$ long) obcordate or obovate and notched, and oval fruits in a head. According to common tradition flowering just at the proper time for planting Indian Corn.

§ 2. *Flowers yellow (earlier than the leaves), in a small umbel, surrounded by a small and dull-colored involucre of 4 scales: fruit bright red.*

C. Mas. Sparingly planted from Eu.: a tall shrub or low tree, with oval pointed leaves and handsome oblong fruit, the pulp eatable and pleasantly acid.

§ 3. *Flowers white in open and flat cymes, without involucre, in early summer: fruit small, globular, not eatable, blue or white, in an exotic species black.*

* *Branches of the previous year red or purple, especially in spring.*

C. sanguínea, European Red-Osier D. Sometimes planted from Eu.: erect, with ovate leaves rather downy beneath, and black or dark purple fruit.

C. stolonífera, Wild Red-Osier D. Shrub 3° – 6° high, in wet places N., spreading by prostrate or subterranean running shoots, smooth, with ovate abruptly pointed leaves roughish both sides and whitish beneath, small cymes, and white or lead-colored fruit.

C. seríicea, Silky D. or Kinnikinnik (the dry bark smoked by the Indians W.): in wet places, has dull red branches, the shoots, cymes, and lower face of the narrow ovate or oblong pointed leaves silky-downy; fruit bluish.

* * *Branches brownish or gray.*

C. asperifòlia, Rough-leaved D. Dry soil from Illinois S.: shrub 3° – 5° high, with branches and small oblong or ovate leaves pubescent, upper face of the latter rough, the lower downy; cymes small and flat; fruit bluish.

C. stricta, Stiff D. Wet grounds S.: shrub 8° – 15° high, with ovate or lance-ovate taper-pointed leaves smooth and green both sides, loose flat cymes, and pale blue fruit.

C. paniculàta, Panicled D. Moist grounds, common N.: shrub 3° – 8° high, much branched, smooth, with ash-colored bark, lance-ovate pointed leaves acute at base and whitish beneath, and proportionally large and numerous convex cymes, often panicled; fruit white.

* * * *Branches green streaked with brownish or whitish.*

C. circinàta, Round-leaved D. Wooded hillsides, &c.: shrub 3° – 10° high, with warty-dotted branches, pretty large round-oval and short-pointed leaves downy beneath, small flat cymes, and light blue fruit.

C. alternifòlia, Alternate-leaved D. Hillsides and banks of streams: shrub or tree 8° – 25° high, with streaked alternate and spreading branches, ovate or oblong taper-pointed leaves acute at base and only minutely pubescent beneath, mostly *alternate*, but crowded at the end of the branches; cymes large and flat, very open; fruit bright blue on reddish stalks.

2. AÙCUBA. The Japanese name of the species commonly cultivated as a house-plant, viz.

A. Japónica. Shrub, with large ovate-oblong leaves bright green and usually marbled with yellow, the flowers inconspicuous, but the red berries when formed handsome.

3. NÝSSA, TUPELO, PEPPERIDGE, SOUR GUM-TREE. (The Greek name of a Nymph, of no very obvious application to these trees.) Fl. spring. Fruit acid.

* *Sterile flowers in loose clusters: fruit blue, not eatable.*

N. multiflòra, Common Tupelo or Sour Gum, in rich woods, N. & S.: tree 30° – 50° high, with horizontal branches and Beech-like spray, ovate or obovate leaves entire and smooth or glossy when old, fertile flowers 3 – 8 on the

slender peduncle, and dark blue oval fruit ½′ long. Wood tough, hard to split. Leaves changing to bright crimson in autumn.

N. aquática, Water Tupelo, of the S., in pine-barren swamps; with smaller leaves than in the preceding (1′ – 2′ long) and varying from lance-oblong to roundish, short peduncles, the fertile 1 – 2-flowered, and smaller oval fruit.

N. uniflòra, Large Tupelo; in water, from Virg. and Kentucky S.: large tree, with leaves ovate or oblong, acute, often with a few sharp teeth, 4′ – 6′ long, on slender petioles, downy beneath; fertile peduncles long and 1-flowered; fruit oblong, about 1′ long. Wood soft: roots very spongy, used for corks.

* * *Sterile flowers in a head: oblong fruit red and eatable.*

N. capitàta, Ogeechee Lime; so called from the acid fruit (1′ or more long): in swamps far S.: a small tree, with oblong or obovate leaves (3′ – 5′ long) downy beneath; fertile flowers solitary on very short peduncles.

II. MONOPETALOUS DIVISION.

Includes the orders of this class which have both calyx and corolla, and the latter in one piece, that is, the petals united more or less into one body.

57. CAPRIFOLIACEÆ, HONEYSUCKLE FAMILY.

Shrubs, or rarely herbs, with calyx adherent to the 2 – 5-celled ovary (the teeth or limb above it sometimes nearly obsolete or obscure), stamens as many as the lobes of the corolla (or in Linnæa one fewer) and borne on its tube, and opposite leaves without stipules. Yet in some species of Viburnum there are little appendages imitating stipules on the base of the petiole. Seeds with a small embryo in fleshy albumen.

§ 1. *Perennial herbs, with bell-shaped or tubular corolla, prominent awl-shaped or linear lobes to the calyx, and a slender style tipped with a capitate stigma.*

1. LINNÆA. A pair of flowers nodding on the summit of a slender scape-like peduncle. Corolla narrow bell-shaped, with 5 almost equal rounded lobes. Stamens 4, two of them shorter. Ovary and small pod 3-celled, but perfecting a seed in only one cell. Creeping evergreen herb.
2. TRIOSTEUM. Flowers sessile in the axils of the leaves, single or in a cluster. Corolla oblong-tubular, with 5 short almost equal lobes, scarcely longer than the leaf-like lobes of the calyx. Stamens 5, equal. Fruit fleshy, orange or red, crowned with the persistent calyx-lobes, containing 3 bony seeds or rather nutlets. Erect and coarse leafy herbs; their leaves narrowed at base, but united around the simple stem.

§ 2. *Shrubby, with tubular or bell-shaped corolla, slender style, and capitate stigma.*

* *Teeth of the calyx very short on the 2 – 4-celled ovary: fruit a berry: leaves simple, entire, or rarely wavy or lobed on some vigorous young shoots.*

3. SYMPHORICARPUS. Flowers small, in close clusters or interrupted spikes. Corolla bell-shaped, with 4 or 5 equal roundish lobes and as many short stamens in the throat. Ovary 4-celled, but the berry only 2-seeded, two cells being empty. Low upright shrubs, with oval short-petioled leaves.
4. LONICERA. Corolla tubular, funnel-form, or oblong, more or less irregular, being gibbous or bulging on one side at base, and the 5 lobes not all alike, but in one species nearly so. Stamens 5. Ovary 2 – 3-celled, becoming a several-seeded berry. Twining or upright shrubs.

* * *Teeth or lobes of the calyx slender, on the summit of the slender or taper-pointed ovary which becomes a many-seeded 2-valved pod: leaves simple, serrate.*

5. DIERVILLA. Corolla funnel-form, almost regular, 5-lobed. Stamens 5. Ovary narrow, sometimes linear and stalk-like. Low upright shrubs, with flowers in terminal or axillary loose clusters or cymes.

§ 3. *Shrubs or some low trees, with small flowers in broad cymes, short and widely open deeply 5-lobed regular corolla, 1–3 sessile stigmas, and berry-like fruit, containing 1–3 seeds or rather seed-like stones. Calyx-teeth on the ovary very short or obscure: stamens 5.*

6. VIBURNUM. Leaves simple. Fruit containing a single flat or flattish stone.
7. SAMBUCUS. Leaves pinnate, and the oblong or lanceolate leaflets serrate. Fruit containing 3 seeds or rather small seed-like stones.

1. LINNÆA, TWIN-FLOWER. (Named for *Linnæus.*) Only one species,

L. boreàlis. Mossy woods and cold bogs N.: creeping stems bearing round-oval and sparingly crenate somewhat hairy small leaves, and in early summer the sweet-scented flowers; corolla purple and whitish, hairy inside.

2. TRIÓSTEUM, FEVERWORT, HORSE-GENTIAN. (Greek for *three bones*, from the 3 bony seeds or rather stones.) The root has been used in medicine, and the seeds for coffee. In rich soil: fl. early summer.

T. perfoliàtum, the common species, is softly hairy, 2°–4° high, with oval leaves abruptly narrowed at base, and brownish-purple flowers.

T. angustifòlium, chiefly S., a smaller and bristly-hairy plant, with narrower lanceolate leaves more tapering at base, and greenish or cream-colored flowers.

3. SYMPHORICÁRPUS. (Name from the Greek, denotes *crowded fruits.*) Wild on rocky banks, especially W. & S., and cult. for the ornamental insipid berries. Flowers white or slightly rose-color, produced all summer.

S. racemòsus, SNOWBERRY. Clusters of flowers in interrupted leafy spikes (rather than racemes) terminating the branches; berries snow-white, in autumn. Common in gardens.

S. vulgàris, CORAL-BERRY, INDIAN CURRANT. Short clusters of flowers in the axils of most of the leaves; berries small, dark red.

4. LONICÈRA, HONEYSUCKLE, WOODBINE. (Named for an old German herbalist, *Lonitzer*, latinized *Lonicerus.*)

§ 1. TRUE HONEYSUCKLES, *with twining stems (in one wild species slightly so).*

* *Corolla with very long tube and 5 short almost regular lobes.*

L. sempérvirens, TRUMPET H. Wild from New York S., and commonly cult. Leaves evergreen (as the name denotes) only at the S., thickish, pale beneath, the lower oblong, the uppermost pairs united round the stem; flowers scentless, in spiked whorls, 2′ long, scarlet with yellow inside (also a yellow variety), produced all summer; berries red.

* * *Corolla strongly 2-lipped; lower lip narrow, upper one broad and 4-lobed.*

+– *The 2 to 4 uppermost pairs of leaves united round the stem in the form of an oval or rounded disk or shallow cup, the flowers sessile in their axils, or partly in leafless spiked whorls beyond: berries red or orange.*

++ *European Honeysuckles, cultivated for ornament: flowers purple and white or turning yellowish inside, sweet-scented, in summer.*

L. Caprifòlium, COMMON EUROPEAN H., has leaves smooth on both sides, and flowers usually only in early summer.

L. Etrúsca, ITALIAN or PERPETUAL H., has the leaves downy beneath and blunter, and flowers through the summer.

++ ++ *Wild species, with flowers smooth and nearly scentless, except the first species, in late spring or early summer: leaves smooth (except one variety) and glaucous or whitish beneath.*

L. gràta, SWEET WILD H. Wild in Middle States and S., sometimes cult.: leaves obovate; corolla white with a pink or purple slender tube, fading yellowish, fragrant.

L. flàva, YELLOW H. Wild N. W. and along the Alleghanies; low-climbing; the broad and thickish leaves very white-glaucous both sides; flowers light yellow.

L. parviflòra, SMALL H. Low and bushy, with oblong leaves green above, but very white-glaucous beneath; the corolla (less than 1′ long) strongly gibbous at base, greenish-yellow or whitish and tinged with purple: in the var. **Douglasii,** found only N. W., nearly crimson, and the greener leaves downy beneath or ciliate.

+ + + *Wild species with clammy-pubescent orange-colored flowers.*

L. hirsùta, HAIRY H. Moist or rocky grounds N. & W.: with oval and large dull green leaves, the lower face and branches downy-hairy.

+ + *Leaves all separate and short-petioled, not glaucous, pubescent: flowers in pairs on axillary peduncles.*

L. Japónica (commonly so called, L. CONFÙSA, DC.), JAPAN or CHINESE H. Commonly cult.; the slender downy stems twining freely, with oval dull green leaves, and flowers very fragrant at evening; corolla deeply 2-lipped, reddish outside, white inside turning yellow.

§ 2. FLY-HONEYSUCKLES, *upright or straggling bushes, never twining, with leaves all distinct to the base, and a pair of flowers on the summit of an axillary peduncle, the two berries sometimes united into one.*

* *Four large leafy bracts surrounding two cylindrical (¾′ long) yellowish flowers.*

L. involucràta. Wild from Lake Superior to California, and sparingly planted: shrub 2° – 5° high, downy when young, with ovate or oblong leaves 3′ – 5′ long, on short petioles, clammy flowers, and berries quite separate.

* * *The two or four bracts under the ovaries small or minute.*

+ *Planted for ornament from Europe: flowers rose or pink-red, profuse and showy.*

L. Tartárica, TARTARIAN H. Much-branched shrub 5° – 8° high, smooth, with oval heart-shaped leaves, short corolla, and red berries uniting at base as they ripen: fl. spring.

+ + *Wild species, in moist cold woods or bogs N.: flowers yellowish.*

L. ciliàta, EARLY FLY-H. Straggling, 3° – 5° high, with oval or oblong and partly heart-shaped leaves thin and downy beneath when young, slender peduncles, honey-yellow corolla (¾′ long) with short nearly equal lobes and very unequal-sided base, and separate red berries: fl. early spring.

L. oblongifòlia, SWAMP F. Upright, 2° – 5° high, with oblong leaves, long and slender peduncles, deeply 2-lipped corolla (½′ long) in early summer, and purple berries.

L. cærùlea, MOUNTAIN F., the rarest species, 1° – 2° high, with oval leaves, very short peduncle, moderately 5-lobed corolla, and two ovaries united to form one blue berry.

5. DIERVÍLLA, BUSH-HONEYSUCKLE. (Named for one *Dierville,* who took the common species from Canada to France.)

* *Wild species, on rocks and hills, with pale or honey-yellow and slender funnel-form corolla, not showy, and oblong pod.*

D. trífida, COMMON B.; everywhere N., 1° – 4° high, with oblong-ovate taper-pointed leaves on distinct petioles, mostly 3-flowered peduncles, and slender pointed pods: fl. all summer.

D. sessilifòlia, only along the Alleghanies S., has lance-ovate sessile leaves, many-flowered peduncles, and short-pointed pods: fl. summer.

* * *Planted for ornament from Japan and China; the showy rose-colored corolla broadly funnel-form with an abruptly narrowed base, very slender stalk-like ovary and linear pod.*

D. Japónica. Shrub 2° – 5° high, loaded with the handsome flowers in late spring; corolla 1′ or more long; leaves oblong-ovate, taper-pointed.

6. VIBÚRNUM, ARROW-WOOD, &c. (Ancient Latin name, of uncertain meaning.) Flowers white, or nearly so, in spring or early summer: fruit ripe in autumn.

§ 1. *Flowers all alike, small, and perfect.*

* *Cult. or planted from S. Europe, with evergreen smooth entire leaves.*

V. Tìnus, LAURESTINUS. Not hardy N., but a common house-plant, winter-flowering, or planted out in summer; leaves oblong; fruit dark purple.

* * *Wild species, some occasionally planted: leaves deciduous, at least N.*

+– *Leaves not lobed nor coarsely toothed, smooth or with some minute scurf: fruit black or with a bluish bloom.*

++ *Leaves glossy, finely and evenly serrate with very sharp teeth.*

V. Lentàgo, SHEEP-BERRY. Tree 15°–30° high, common in moist grounds, chiefly N.; leaves ovate, conspicuously pointed, on long margined petioles; cyme broad, sessile; fruit oval, ½′ or more long, sweet, eatable.

V. prunifòlium, BLACK HAW. Dry soil, from Conn. to Ill. and S.: hardly so tall as the preceding, with smaller and oval mostly blunt leaves.

++ ++ *Leaves entire or with a few wavy or crenate small teeth, thickish.*

V. obovàtum. Along streams from Virginia S.: shrub with obovate leaves seldom over 1′ long, and small sessile cymes.

V. nùdum, WITHE-ROD. Swamps, from New England to Florida; with leaves oval, oblong, or almost lanceolate, not glossy; cyme on a peduncle; fruit roundish.

+– +– *Leaves coarsely toothed, strongly feather-veined, the veins prominently marked, straight and simple or nearly so: fruit small: cyme peduncled.*

V. dentàtum, ARROW-WOOD (the stems having been used by the Indians to make arrows). Common in wet soil, 5°–10° high, smooth, with ash-colored bark, pale and broadly ovate evenly sharp-toothed leaves, on slender petioles, and bright blue fruit.

V. mólle, SOFT A. From Kentucky S., soft-downy, with less sharply toothed oval or obovate leaves, on slender petioles, and blue oily fruit.

V. pubéscens, DOWNY A. Rocky grounds, N. & W.; a low and straggling shrub, with ovate or oblong and acute or taper-pointed leaves, having rather few coarse teeth, their lower surface and the very short petioles soft-downy; fruit dark purple.

+– +– +– *Leaves both coarsely toothed and somewhat 3-lobed, roundish, 3–5-ribbed from the base and veiny: cymes slender-peduncled, small: fruit red.*

V. acerifòlium, MAPLE-LEAVED A. or DOCKMACKIE. Shrub 3°–6° high, in rocky woods, with 3-ribbed and 3-lobed leaves soft-downy beneath, their pointed lobes diverging; stamens slender.

V. pauciflòrum. Cold woods, only far N. or on mountains; with almost smooth leaves 5-ribbed at base and 3-lobed at summit; cyme few-flowered; fruit sour.

§ 2. *Flowers round the margin of the cyme neutral (without stamens or pistils) and very much larger than the fertile ones, Hydrangea-like and showy: petioles bearing evident appendages which imitate stipules: fruit red, sour.*

V. Ópulus, CRANBERRY-TREE. Tall and nearly smooth shrub, with gray bark, scaly buds, 3–5-ribbed and strongly 3-lobed leaves, the lobes pointed and commonly few-toothed, and cymes peduncled. The wild form in low grounds N. & E.; the juicy acid fruit bright red, used as a substitute for cranberries (whence the name of HIGH CRANBERRY-BUSH). The long-cultivated form from Europe, planted for ornament, under the name of GUELDER ROSE or SNOWBALL-TREE, has most of the flowers of the cyme changed into enlarged corollas.

V. lantanoìdes, HOBBLE-BUSH (popular name from the straggling or reclining branches taking root at the end, and forming loops; the botanical name because the leaves resemble the V. LANTÀNA or WAYFARING-TREE of

Europe, occasionally planted (but that has no enlarged neutral flowers) : cold moist woods N., with naked buds, large round-ovate leaves heart-shaped at base and abruptly pointed at the apex, closely serrate, and pinnately many-veined, the veins and netted veinlets prominent underneath and covered, like the stalks and branchlets, with rusty scurf; cymes showy, very broad, sessile; fruit not eatable, coral-red turning crimson.

7. SAMBÙCUS, ELDER. (From Greek name of an ancient musical instrument, supposed to have been made of Elder stalks.)

S. Canadénsis, COMMON or BLACK-BERRIED ELDER. Alluvial soil, fence-rows, &c. Stems woody only towards the base, 5° – 6° high, with white pith, 7 – 11 oblong smooth or smoothish leaflets, the lowermost often 3-parted; flat cymes in early summer, and small black-purple fruit.

S. pùbens, RED-BERRIED E. Rocky woods chiefly N., with more woody stems and warty bark, yellow-brown pith, fewer and more lanceolate leaflets downy underneath, panicle-like or convex cymes, in spring, followed by bright red berries.

58. RUBIACEÆ, MADDER FAMILY.

Like the preceding family, but with stipules between the opposite (or sometimes ternately whorled) entire leaves, or else (in the true Madder Family) the leaves whorled without stipules. An immense family in the tropics, and here represented by several wild and a few commonly cultivated species. (The commonest in choice conservatories, not here described, are BURCHÉLLIA CAPÉNSIS, a shrub with a head of orange-scarlet flowers, the corolla almost club-shaped; MANÉTTIA CORDIFÒLIA, a twiner with ovate somewhat heart-shaped leaves, and long tubular somewhat 4-sided scarlet corollas, or M. BÍCOLOR, with lanceolate leaves, and corolla red toward the base, yellow toward the summit; PENTAS CÁRNEA, with ovate-oblong hairy leaves, and terminal cyme of handsome flowers, with salver-form flesh-colored corolla, hairy in the enlarged throat and 5-lobed.)

I. MADDER FAMILY PROPER. Leaves in whorls, without stipules. Ovary 2-celled, forming a small and twin, fleshy or berry-like, or else dry and sometimes bur-like, 2-seeded fruit. Calyx above the ovary obsolete.

1. RUBIA. Like the next, but the divisions of the corolla and the stamens 5. Fruit berry-like.
2. GALIUM. Flowers small or minute, mostly in clusters, with a wheel-shaped 4-parted (or sometimes 3-parted) corolla, and as many short stamens. Styles 2. Slender herbs, with square stems, their angles and the edges of the leaves often rough or almost prickly.

II. CINCHONA FAMILY, &c. Leaves opposite, or sometimes in threes or fours, and with stipules.

§ 1. *Only a single ovule and seed in each cell.*

* *Low herbs, with narrow funnel-form or salver-form corolla, its lobes (valvate in the bud) and the stamens 4.*

3. DIODIA. Flowers sessile in the axils of the narrow leaves. Stipules sheathing, dry, fringed with long bristles. Ovary 2-celled, in fruit splitting into 2 hard and dry closed nutlets.

4. MITCHELLA. Flowers in pairs at the end of branches, the two ovaries united into one, which in fruit forms a 2-eyed scarlet berry. Corolla densely white-bearded inside, white or purplish-tinged outside. Style 1: stigmas 4, slender. Seeds, or rather little stones, 4 to each of the two flowers. Stipules small, not fringed.

* * *Shrubs or small trees: lobes of the corolla overlapping in the bud.*

5. CEPHALANTHUS. Flowers many and small, crowded in a close round head raised on a peduncle. Calyx 4-toothed. Corolla tubular with 4 very short lobes. Stamens 4. Style long and much protruded, tipped with a capitate stigma. Fruit small, dry and hard, inversely pyramidal, at length splitting into 2 or 4 closed one-seeded portions.

6. COFFEA. Flowers in small clusters in the axils of the leaves. Calyx 4–5-toothed. Corolla with a short tube and 4 or 5 spreading lobes of about the same length. Stamens 4 or 5, with linear-oblong anthers. Style bearing 2 slender stigmas. Ovary 2-celled, becoming a small berry, containing 2 hard plano-convex seeds with a groove down the face (*coffee*), enclosed in a loose parchment-like hull.

§ 2. *Several or many ovules and seeds in each cell of the ovary and fruit.*

* *Shrubs or low trees, all except the first exotic house-plants.*

7. PINCKNEYA. Flowers in a terminal compound cyme. Calyx with 5 lobes, 4 of them small and lanceolate, the fifth often transformed into a large bright rose-colored leaf! Corolla hairy, with a slender tube and 5 oblong-linear recurving lobes. Stamens 5, protruding. Fruit a globular 2-celled pod, filled with very many thin-winged seeds.

8. GARDENIA. Flowers solitary at the end of the branches or nearly so, large, very fragrant. Calyx with 5 or more somewhat leaf-like lobes. Corolla funnel-shaped or salver-shaped, with 5 or more spreading lobes convolute in the bud, and as many linear anthers sessile in its throat. Style 1: stigma of 2 thick lobes. Fruit fleshy, surmounted by the calyx-lobes, ribbed down the sides, many-seeded.

9. BOUVARDIA. Flowers in clusters at the end of the branches. Calyx with 4 slender lobes. Corolla with a long and slender or somewhat trumpet-shaped tube, and 4 short spreading lobes, valvate in the bud. Anthers 4, almost sessile in the throat. Style 1: stigma of 2 flat lips. Pod small, globular, 2-celled. Seeds wing-margined.

* * *Low, native herbs.*

10. HOUSTONIA. Corolla salver-form or funnel-form, the 4 lobes valvate in the bud. Stamens 4. Style 1: stigmas 2. Pod short, 2-celled, the upper part rising more or less free from the 4-lobed calyx, opening across the top, and ripening rather few saucer-shaped or thimbel-shaped pitted seeds in each cell. Stipules short and entire, sometimes a mere margin connecting the bases of the opposite leaves.

1. RÙBIA, MADDER. (Name from Latin *ruber*, red, alludes to the red roots, which furnish the well-known red dye.)

R. tinctòria, COMMON or DYERS' M. Cult. from Eu. for the red roots. branching from the ground, 1° – 2° high, with angles of the stems and edges of the lance-oblong or oblanceolate leaves (mostly in sixes) very rough; flowers greenish, in summer; berry black. ♃

2. GÀLIUM, BEDSTRAW or CLEAVERS. (Name from Greek for milk, which some species in Europe were used to curdle.) Fl. summer. The following all wild species. Several have a red root like that of Madder.

§ 1. *Fruit a black berry, like that of Madder: but the parts of the white flower are only* 4. *Only in Southern States, in dry sandy soil.* ♃

G. hispídulum. Spreading stems 1° – 2° long; leaves in fours, ½′ or less in length, lance-ovate; peduncle 1 – 3-flowered; berry roughish.

G. uniflòrum. Smooth, slender, 1° high; leaves linear; flowers mostly solitary.

§ 2. *Fruit dry when ripe, small.*

* *Smooth: leaves with strong midrib but no side ribs or nerves: flowers white, loosely clustered at the end of spreading branches.*

G. aspréllum, Rough Bedstraw. Low thickets: 3° - 5° high, as it were climbing, the backwardly prickly-roughened angles of the stem and edges and midrib of the lance-oblong pointed leaves adhering to contiguous plants; leaves in whorls of 6 on the stem and of 4 or 5 on the branchlets: flowers numerous.

G. trífidum, Small B. Swamps and low grounds, 6′ - 2° high, roughish or sometimes nearly smooth; leaves varying from linear to oblong, 4 - 6 in the whorls; flowers rather few, their parts often 3.

* * *Fruit smooth or slightly bristly: leaves 3-nerved: flowers white, in a narrow and long terminal panicle.* ♃

G. boreàle, Northern B. Rocky banks of streams N.; 1° - 2° high, smooth, erect, with lance-linear leaves in fours.

* * * *Fruit a little bur, being covered with hooked prickles.*

+ *Leaves mostly 6 or 8 in a whorl, with midrib and no side nerves: flowers whitish or greenish: stems reclining or prostrate, bristly-rough backwards on the angles.*

G. Aparìne, Cleavers or Goose-Grass. Low grounds: leaves in eights, lanceolate, rough-edged, 1′ - 2′ long; peduncles axillary, 1 - 2-flowered; fruit large. ①

G. triflòrum, Sweet-scented Bedstraw. Woodlands, especially N.: leaves mostly in sixes, lance-oblong, bristle-pointed; peduncles terminating the branches, 3-flowered. Sweet-scented in drying. ♃

+ + *Leaves all in fours, more or less 3-nerved: flowers not white: stems ascending, about 1° high, rather simple, not prickly-roughened.* ♃

G. pilòsum. Commonest S., in dry thickets: leaves oval, dotted, downy, 1′ long; flowers brown-purple or cream-colored, all pedicelled, the peduncle 2 - 3-times forked. Var. puncticulòsum is a smooth form S.

G. circæzans, Wild Liquorice, the root being sweetish: common in thickets; leaves oval or oblong, obtuse, ciliate; peduncles once forked, their long branches bearing short-pedicelled dull or brownish flowers along the sides, the fruit reflexed.

G. lanceolàtum, like the preceding, common N.; but with lanceolate or lance-ovate tapering leaves, 2′ long.

3. DIÒDIA, BUTTON-WEED. (Name from Greek for *a thoroughfare*, being humble weeds, often growing by the wayside.) Fl. all summer, white or whitish.

D. Virgínica. Sandy banks from Maryland S.; with spreading stems 1° - 2° long, broadly lanceolate sessile leaves, salver-shaped corolla ½′ long, 2-parted style, and oblong fruit crowned with 2 calyx-teeth. ♃

D. tères. Sandy fields from N. Jersey and Illinois S.; with slender stems 3′ - 9′ long, linear and rigid leaves, small corolla rather shorter than the long bristles of the stipules, undivided style, and obovate little fruit crowned with the 4 short calyx-teeth. ①

4. MITCHÉLLA, PARTRIDGE-BERRY. (Named for *Dr. J. Mitchell*, who corresponded from Virginia with Linnæus.) Fl. in early summer. ♃

M. rèpens, the only species, common in woods; a little herb, creeping over the ground, with the small evergreen leaves round-ovate, very smooth and glossy, bright green, sometimes with whitish lines, short-petioled; the flowers pretty and sweet-scented; the scarlet fruit remaining over winter, eatable, but dry and almost tasteless.

5. CEPHALÁNTHUS, BUTTON-BUSH. (Name from Greek words for *head* and *flower*.) Fl. summer and autumn.

C. occidentàlis, the only species, is a tall shrub, common along the bor-

ders of ponds and streams, with lance-oblong or ovate-pointed leaves, on petioles, either in pairs or threes, and with short stipules between them; the head of white flowers about 1′ in diameter.

6. COFFÈA, COFFEE-TREE. (The Arabic name somewhat altered.)

C. Arábica, the species which produces Coffee, is a shrub or small tree, sometimes cult. in conservatories, with smooth and glossy oblong leaves, bearing fragrant white flowers in their axils, followed by the red berries, containing the pair of seeds.

7. PINCKNÈYA, GEORGIA BARK or FEVER-TREE. (Named by Michaux in honor of *Gen. Pinckney.*)

P. pùbens, the only species, is a rather downy small tree or shrub, in wet pine barrens, S. Car. to Georgia, with large oval leaves, slender stipules, and purplish flowers of little beauty, but the great calyx-leaf commonly produced is striking. This plant is of the same tribe with the CINCHONA or PERUVIAN BARK, and has similar medicinal (tonic) properties. Fl. early summer.

8. GARDÈNIA, CAPE JESSAMINE. Not an appropriate name, as the species so called does not belong to the Cape of Good Hope. (Named for *Dr. Garden* of South Carolina, who corresponded with Linnæus.)

G. flórida, CAPE JESSAMINE. A favorite house-plant from China, 2°–4° high, with smooth and bright-green oblong leaves acute at both ends, large and showy very fragrant flowers, the white corolla 5–9-lobed, or full double, and large oblong orange-colored berry 5–6-angled and tapering at the base.

9. BOUVÁRDIA. (Named for *Dr. Bouvard,* director of the Paris Garden of Plants over a century ago.)

B. triphýlla. Shrubby or half-shrubby house-plants, blossoming through the winter, and in grounds in summer, from Mexico, with ovate or oblong-ovate smoothish leaves, in threes or the upper in pairs, and scarlet corolla, minutely downy outside, nearly 1′ long.

B. leiántha, now commoner and winter-blooming, has more downy leaves and smooth deep-scarlet corolla.

10. HOUSTÒNIA. (Named by Linnæus for a *Dr. Houston,* an English physician, who botanized on the coast of Mexico, where he died early.)

* *Delicate little plants, with 1-flowered peduncles, flowering from early spring to summer: corolla salver-form: pod somewhat 2-lobed, its upper half free: seeds with a deep hole occupying the face.*

H. cærùlea, COMMON H. or BLUETS. Moist banks and grassy places, 3′–5′ high, smooth and slender, erect, with oblong or spatulate leaves only 3″ or 4″ long, very slender peduncle, and light blue, purplish, or almost white and yellowish-eyed corolla, its tube much longer than the lobes. ②

H. mínima. Dry hills from Ill. S. W.: roughish, 1′–4′ high, at length much branched and spreading; with leaves ovate, spatulate, or the upper linear, earlier peduncles slender, the rest short, and tube of the purplish corolla not longer than its lobes and those of the calyx. ① ②

H. rotundifòlia. Sandy soil from North Carolina S.: with prostrate and creeping leafy stems, peduncles shorter than the roundish leaves and recurved in fruit; corolla white. 2ℓ

* * *Erect, leafy-stemmed, 5′–20′ high, with flowers in terminal clusters or cymes, in summer: corolla funnel-form: seeds rather saucer-shaped.* 2ℓ

H. purpùrea. Wooded or rocky banks, commoner W.: smooth or slightly downy, with ovate or lanceolate 3–5-ribbed leaves, pale purple flowers, and upper half of globular pod free from the calyx.

Var. **longifòlia,** the common one N.; slender or low, with 1-ribbed leaves, those of the stem varying from lance-oblong to linear.

H. angustifòlia. Dry banks from Ill. S. & W., with tufted erect stems, narrow-linear and acute 1-ribbed leaves, crowded short-pedicelled flowers, lobes of the white corolla densely bearded inside, and only the top of the obovate pod rising above the calyx.

59. VALERIANACEÆ, VALERIAN FAMILY.

Herbs, with opposite leaves, no stipules, calyx coherent with the ovary, which has only one fertile one-ovuled cell but two abortive or empty ones, and stamens always fewer than the lobes of the corolla (1 – 3, distinct), and inserted on its tube. Style slender: stigmas 1 – 3. Fruit small and dry, indehiscent; the single hanging seed with a large embryo and no albumen. Flowers small, in clusters or cymes.

* *Lobes of the calyx many and slender, but hardly seen when in flower, being rolled up inwards around the base of the corolla; in fruit they unroll and appear as long plumose bristles, resembling a pappus, like thistle-down.*

1. VALERIANA. Corolla with narrow or funnel-form tube usually gibbous at the base on one side, but not spurred, its 5 spreading lobes almost equal. Stamens 3. Akene 1-celled, the minute empty cells early disappearing. Root strong-scented.
2. CENTRANTHUS. Corolla as in the preceding, but with a spur at the base. Stamen only one.

* * *Lobes of the calyx of a few short teeth or mostly hardly any.*

3. FEDIA. Corolla funnel-form, with 5 equal or rather unequal spreading lobes. Stamens mostly 3. Akene-like fruit with one fertile and two empty cells, or the latter confluent into one.

1. VALERIÀNA, VALERIAN. (Name from *valere*, to be well, alluding to medical properties, the peculiar-scented root of some species used in medicine.) Fl. early summer, often dicœcious, white or purplish. ♃

* *Garden species from Europe, producing the medicinal Valerian-root.*

V. officinàlis, the commonest in gardens, 2° – 3° high, a little downy, with leaves of 11 to 21 lanceolate or oblong cut-toothed leaflets, and rootstocks not running.

V. Phu, is smoother, with root-leaves simple, stem-leaves of 5 – 7 entire leaflets or lobes, and rootstock horizontal.

* * *Wild species N. and chiefly W.: all rather rare or local.*

V. pauciflòra. Woodlands, Penn. to Illinois and S. W.; 1° – 2° high, smooth, with thin ovate and heart-shaped toothed root-leaves, stem-leaves of 3 – 7 ovate leaflets, rather few flowers in the crowded panicled cyme, and long slender corolla.

V. sylvática. Cedar swamps from Vermont W. & N.; with root-leaves mostly ovate or oblong and entire, stem-leaves with 5 – 11 lance-oblong or ovate almost entire leaflets; corolla funnel-form.

V. édulis. Alluvial ground from Ohio W.; 1° – 4° high, with a large spindle-shaped root (eaten by the Indians W.), thickish leaves mostly from the root and minutely woolly on the edges, those of the root lanceolate or spatulate, of the stem cut into 3 – 7 long and narrow divisions.

2. CENTRÁNTHUS, SPURRED VALERIAN. (From Greek words for *spur* and *flower*.) Fl. summer. ♃

C. rùber, Red S. or Jupiter's-Beard. Cult. for ornament, from S. Eu.: a very smooth rather glaucous herb, 1° – 2° high, with lance-ovate nearly entire leaves, all the upper ones sessile, and cymes of small flowers in a narrow panicle, the corolla very slender, ½′ long, red, rarely a white variety.

3. FÈDIA, CORN SALAD, LAMB-LETTUCE. (Origin of the name obscure.) Our species are all very much alike in appearance, smooth, with forking stems 6′ – 20′ high, tender oblong leaves either entire or cut-lobed towards the base, and small flowers in clusters or close cymes, with leafy bracts, and a short white or whitish corolla, in early summer. They belong to the section (by most botanists regarded as a separate genus) VALERIANELLA. ① ②

F. olitòria, COMMON CORN SALAD of Eu., sparingly naturalized in the Middle States, has fruit broader than long, and a thick corky mass at the back of the fertile cell.

F. Fagopỳrum, from New York W. in low grounds, has ovate-triangular smooth fruit shaped like a grain of buckwheat when dry (whence the specific name), the confluent empty cells occupying one angle, and much smaller than the broad and flat seed.

F. radiàta, common from Penn. and Michigan S., has fruit mostly downy and somewhat 4-angled, the parallel narrow empty cells contiguous but with a deep groove between them.

60. DIPSACEÆ, TEASEL FAMILY.

Differs from the preceding family by having the flowers strictly in heads, surrounded by an involucre, as in the next family, — from which it differs in the separate stamens, hanging seed, &c. All are natives of the Old World.

1. DIPSACUS. Coarse and stout herbs, with stems and midrib of leaves often prickly, and the heads with rigid prickly-pointed bracts or chaff under each flower, under the whole a conspicuous leafy involucre. Each flower moreover has an *involucel* in the form of a little calyx-like body enclosing the ovary and akene. Calyx continued beyond the ovary into a mere truncate short cup-like border. Corolla slender, with 4 short lobes. Stamens 4. Style slender.
2. SCABIOSA. Less coarse, not prickly; the short heads surrounded by a softer green involucre; a short scale or soft bristle for a bract under each flower. Corolla funnel-form, 4 – 5-cleft, oblique or irregular; the outer ones often enlarged. Stamens 4. Style slender. Involucel enclosing the ovary and the calyx various.

1. DÍPSACUS, TEASEL. (Name from Greek word meaning *to thirst;* the united bases of the leaves in the common species catch some rain-water.) Fl. summer.

D. sylvéstris, WILD T. Run wild along roadsides, 4° – 5° high, prickly, with lance-oblong leaves, the upper ones united round the stem, large oblong heads, purplish or lilac corollas, and slender-pointed straight chaff under each flower. ②

D. fullònum, FULLER'S T. Less prickly than the other, with involucre hardly longer than the flowers, the awn-like tips of the rigid chaff hooked at the end, which makes the *teasel* useful for carding woollen cloth: cultivated in fields for this purpose, sometimes escaping into waste places and roadsides. ②

2. SCABIÒSA, SCABIOUS. (From Latin word for *scurfy,* perhaps from use of the plants to cure skin-diseases.) Fl. summer. One European species is commonly cultivated for ornament, viz.

S. atropurpùrea, SWEET S., or when with dark purple or crimson flowers called MOURNING BRIDE; the flowers are sometimes rose-colored or even white: plant 1° – 2° high, with obovate or spatulate and toothed root-leaves, pinnately-parted stem-leaves, the cup or involucel enclosing the ovary 8-grooved, calyx proper with 5 long bristles surmounting the akene; the outer corollas enlarged. ①

61. COMPOSITÆ, COMPOSITE FAMILY.

Herbs, or a very few shrubs, known at once by the "compound flower," as it was termed by the older botanists, this consisting of several or many flowers in a head, surrounded by a set of bracts (formerly likened to a calyx) forming an *involucre*, the stamens as many as the lobes of the corolla (almost always 5) and inserted on its tube, their *anthers syngenesious*, i. e. united in a ring or tube through which the style passes. Calyx with its tube incorporated with the surface of the ovary, its limb or border (named the *pappus*) consisting of bristles, either rigid or downy, or of teeth, awns, scales, &c., or of a cup or crown, or often none at all. Corollas either tubular, funnel-form, &c. and lobed, or strap-shaped (ligulate), or sometimes both sorts in the same head, when the outermost or marginal row has the strap-shaped corollas, forming *rays* (which answered to the corolla of the supposed compound flower), the separate flowers therefore called *ray-flowers;* those of the rest of the head, or *disk*, called *disk-flowers*. The end of the stalk or branch upon which the flowers are borne is called the *receptacle*. The bracts, if there are any, on the receptacle (one behind each flower) are called the *chaff* of the receptacle; the bracts or leaves of the involucre outside the flowers are commonly called *scales*. Style 2-cleft at the apex. Ovary 1-celled, containing a single ovule, erect from its base, in fruit becoming an akene. Seed filled by the embryo alone. For the flowers and fruit, and the particular terms used in describing them, see Lessons, p. 93, 94, fig. 266–269; p. 100, fig. 290, 291; p. 121, fig. 379–384.

The largest family of Flowering Plants, generally too difficult for the beginner; but most of the common kinds, both wild and cultivated, are here briefly sketched. For fuller details as to the wild ones, with all the species, the student will consult the Manual, and Chapman's Southern Flora. There are two great divisions which include all the common kinds.

I. Head with only the outermost flowers strap-shaped, and these never perfect, i. e. they are either pistillate or neutral, always without stamens, or else with strap-shaped corollas entirely wanting. Plants destitute of milky or colored juice.

A. *No strap-shaped corollas or true rays.*

§ 1. *Thistles or Thistle-like, the heads with very many flowers, all alike and mostly perfect. Branches of the style short or united, even to the tip. Scales of the involucre many-ranked, these or the leaves commonly tipped with prickly or bristly points.*

* *Pappus of many long-plumed bristles: receptacle with bristles between the flowers.*

1. CYNARA. Scales of the involucre of the great heads thickened and fleshy towards the base, commonly notched at the end, with or without a prickle. Akenes slightly ribbed. Otherwise much as in the next.
2. CIRSIUM. Scales of the involucre not fleshy-thickened, prickly-tipped or else merely pointed. Akenes flattish, not ribbed. Filaments of the stamens separate.

* * *Pappus of naked, rough or short-barbed bristles, or none.*

+– *Filaments of the stamens united into a tube. Leaves white-variegated.*

3. SILYBUM. Scales of the involucre with the upper part leaf-like and spreading, spiny. Receptacle beset with bristles. Akenes flattened: pappus of many rather short and rigid bristles minutely bearded on their edges.

+–+– *Filaments separate.*

4. ONOPORDON. Heads and flowers as in true Thistles, No. 2. Receptacle naked and honeycombed. Akenes 4-angled, wrinkled: pappus of many slender bristles united at base into a horny ring. Stems strongly leaf-winged.
5. LAPPA. Scales of the globular involucre abruptly tipped with a spreading slender awl-shaped appendage, mostly hooked at its point. Receptacle bristly. Akenes flattened, wrinkled: pappus of many short and rough bristles, their bases not united, deciduous. Leaves and stalks not prickly.
6. CARTHAMUS. Outer scales of the involucre leaf-like and spreading, middle ones with ovate appendage fringed with spiny teeth or little spines, innermost entire and sharp-pointed. Receptacle beset with linear chaff. Akenes very smooth, 4-ribbed: pappus none. Leaves with rigid or short spiny teeth.
7. CNICUS and 8. CENTAUREA; see next division.

§ 2. *Thistle-like or Scabious-like, with many-ranked imbricated scales to the involucre, many-flowers, and the two branches of the style united into one body almost or quite to the tip, as in* § 1: *but the outer flowers of the head different from the rest and sterile, except in a few species of Centaurea. Receptacle beset with bristles.*

7. CNICUS. Outer flowers smaller than the rest, slender-tubular, sterile. Scales of the involucre tipped with a long spine-like appendage which is spiny-fringed down the sides. Akenes short-cylindrical, many-ribbed and grooved, crowned with 10 short and horny teeth, within which is a pappus of 10 long and rigid and 10 short naked bristles. Leaves prickly-toothed.
8. CENTAUREA. Outer flowers sterile and with corolla larger than the rest, often funnel-shaped and with long sometimes irregular lobes, forming a kind of false ray; but these are wanting in a few species. Involucre various, but the scales commonly with fringed, sometimes with spiny tips. Akenes flat or flattish: pappus of several or many bristles or narrow scales, or none.

§ 3. *Bur-like or achenium-like in the fruit, which is a completely closed involucre containing only one or two flowers, consisting of a pistil only, with barely a rudiment of corolla, therefore very different from most plants of the family; but the staminate flowers are several and in a flat or top-shaped involucre. Heads therefore monœcious, or rarely diœcious: no pappus. Coarse and homely weeds.*

9. XANTHIUM. Heads of staminate flowers in short racemes or spikes, their involucre of several scales in one row: fertile flowers below them, clustered in the axils, two together in a 2-celled hooked-prickly bur.
10. AMBROSIA. Heads of staminate flowers in racemes or spikes terminating the stem or branches, their involucre of several scales united in flattish or top-shaped cup; fertile flowers clustered below the staminate, only one enclosed in each small achenium-like involucre, which is naked, or with a few tubercles or strong points near the top in a single row.

§ 4. *Plants not thistle-like nor bur-like.*

* *Two kinds of flowers in the same head, the outer ones with pistils only.*

+– *Pappus none or a minute border or cup: no chaff among the flowers: scales of the involucre dry, often with scarious margins, imbricated. Bitter-aromatic or rather acrid plants.*

11. TANACETUM. Heads of many yellow flowers; the marginal ones with pistil only and a 3–5-toothed corolla. Akenes angled or ribbed, with a flat top, crowned with a cup-like toothed or lobed pappus. Very strong-scented herbs, with heads in a corymb.
12. ARTEMISIA. Heads small, of few or many yellow or dull purplish flowers, some of the marginal ones pistillate and fertile, the others perfect, but sometimes not maturing the ovary. Akenes obovate or club-shaped, small at the top, destitute of pappus. Bitter-aromatic, and strong-scented plants, with heads in panicles.

+– +– *Pappus none at all to the outer pistillate and fertile flowers, but of some slender bristles in the central and perfect yet seldom fruit-bearing flowers: scales of the involucre woolly.*

13. FILAGO. Heads small crowded in close clusters, of many inconspicuous flowers, each fertile pistillate flower in the axil of a thin and dry chaffy scale, and with a very slender thread-like corolla; the central flowers with a more expanded 4–5-toothed corolla. Low herbs, clothed with cottony wool: leaves entire.

+– +– +– *Pappus of all the flowers composed of bristles: no chaff among the flowers.*

14. ERECHTHITES. Heads of many whitish flowers, with a cylindrical involucre of many narrow and naked scales in a single row: outer flowers with very slender corolla: inner with more open tubular corolla. Akenes narrow: pappus of copious very fine and soft naked white hairs. Rank coarse herb.

37. ERIGERON. One species has such short and inconspicuous rays that it may be looked for here.

15. GNAPHALIUM. Heads of very many whitish or yellowish flowers, surrounded by an involucre of many ranks of dry and white or otherwise colored (not green) scarious and persistent scales woolly at base; the flowers all fertile, the outer ones with pistil and very slender corolla, the central ones perfect and with more expanded 5-toothed corolla. Pappus a row of very slender and roughish bristles. Cottony herbs.

16. ANTENNARIA. Like Gnaphalium, but the plants nearly or quite dicœcious: the staminate flowers with a simple style, but the ovary sterile, and their pappus of stouter bristles which are thickened at the summit and there more or less barbed or plumed.

* * *Only one kind of flowers in the head.*

+– *Scales of the involucre dry and papery or scarious, often colored (i. e. not green), not withering.* (Everlastings.)

++ *Many flowers in the head: scales of the involucre in many ranks.*

16. ANTENNARIA. Flowers dicœcious, in one plant all pistillate, with very slender corollas and a pappus of long and very fine hair-like naked bristles; in the other staminate (with a simple imperfect style), and the pappus of thicker bristles enlarging and somewhat plumed or barbed at their summit. Leaves and stems cottony.

17. RHODANTHE. Flowers perfect, with open 5-toothed yellowish corollas. Involucre (silvery or rose-colored), smooth, obovate or top-shaped. Akenes woolly: pappus of numerous plumose bristles. Leaves and stems smooth and naked.

18. AMMOBIUM. Flowers perfect, with yellow 5-lobed corollas, surrounded by a silvery-white involucre. Chaffy scales on the receptacle among the flowers. Akenes flattish-4-sided: pappus of 4 teeth, two of them prolonged into a bristle. Leaves and stems white-cottony, the latter with leaf-like wings.

++ ++ *Only 3 or 4 flowers in each head.*

19. HUMEA. Flowers perfect, purplish, surrounded by a few dry and scarious scales of the involucre: no chaff on the small receptacle. Akenes smooth: no pappus. Herbage green, not cottony: the small heads drooping in an ample compound panicle.

+–+– *Scales of the involucre not dry and scarious or papery: flowers all perfect.*

++ *Flowers yellow, with chaff between them: akenes flat, bearing 2–4 awns or bristles.*

53. BIDENS, and 52. COREOPSIS: a few species have no ray-flowers.

++ ++ *Flowers yellow: no chaff: akenes not flat: pappus of copious very soft and fine down-like bristles.*

30. SENECIO, one or two species which are destitute of ray-flowers.

++ ++ ++ *Flowers not yellow nor orange: no chaff among them.*

a. *Branches of the style slender and rough all over with minute bristles.*

20. VERNONIA. Heads corymbed, with an involucre of many imbricated scales, and 15 to 30 or more rose-purple flowers. Lobes of the corolla slender. Akenes cylindrical, several-ribbed: pappus of copious hair-like bristles, surrounded at base by an outer set of very short and fine scales or scale-like bristles. Leaves alternate.

b. *Branches of the style long and slender or mostly rather club-shaped, smooth or very minutely puberulent under a lens.*

21. LIATRIS. Heads of several or many rose-purple flowers, surrounded by a more or less imbricated involucre. Lobes of the corolla rather long. Akenes slender, about 10-ribbed: pappus of many long and slender bristles, which are plumose or else beset with a short beard or roughness for their whole length. Leaves alternate, entire.
22. KUHNIA. Heads small, of 10–25 dull cream-colored flowers, surrounded by a few lanceolate scales of the involucre. Corolla slender, barely 5-toothed. Akenes cylindrical, many-striate: pappus a row of white plumose bristles. Leaves mostly alternate.
23. MIKANIA. Heads of 4 flesh-colored flowers, with an involucre of only 4 scales. Corolla 5-toothed. Akenes 5-angled: pappus a row of hair-like naked (barely roughish) bristles. Leaves opposite; stem twining.
24. EUPATORIUM. Heads of 3 or more flowers, and an involucre of several or many scales. Corolla 5-toothed. Receptacle flat or merely convex. Akenes 5-angled: pappus a row of hair-like naked (barely rough) bristles.
25. CONOCLINIUM. Heads, &c. as in the preceding, but the receptacle conical. Flowers many, blue or blue-purple. Leaves opposite.
26. AGERATUM. Like the preceding; but the receptacle flattish, and the pappus of a few chaffy scales, mostly tapering into a slender stiff rough bristle. Leaves opposite.
27. PIQUERIA. Heads very small, of 3–5 white flowers, and involucre of 4 or 5 scales. Akenes 5-angled: pappus none. Leaves opposite, 3-ribbed.

c. *Branches of the style smooth, with a conical or flat unusally minutely hairy tip.*

28. CACALIA. Heads corymbed, with 5–30 white or whitish flowers. Scales of the involucre a single row, with a few small bractlets at base. Corolla 5-cleft. Akenes oblong, smooth: pappus of very many fine and soft down-like naked bristles. Leaves alternate.
40. BELLIS. A cultivated state of the Daisy, with *quilled* (monstrous) flowers may be sought here.

B. *With strap-shaped corollas or rays at the margin of the head.*

§ 1. *Herbage not spotted with large translucent or colored strong-scented glands.*

* *Pappus of copious hair-like bristles: no chaff on the receptacle among the flowers.*

+– *Rays yellow, except in one or two species of* Senecio *and one* Solidago, *pistillate.*

29. TUSSILAGO. Ray-flowers very numerous and in many rows, fertile, with narrow ligules; the tubular disk-flowers few in the centre, and not fertile. Scale of the involucre nearly in one row. Pappus fine and soft. Head solitary on a scaly-bracted scape.
30. SENECIO. Ray-flowers several in a single row, or sometimes none: the disk-flowers (as in all the following) perfect and fertile. Scales of the involucre in a single row, or often with small bractlets at the base. Pappus very fine and soft. Heads mostly in corymbs. Leaves alternate, simple or compound.
31. ARNICA. Ray-flowers several or many in a single row. Scales of the involucre nearly equal in 2 rows. Pappus a single row of rough rather rigid bristles. Akenes slender. Heads few and rather large. Leaves opposite.
32. INULA. Ray-flowers very numerous in one row, with narrow ligules. Outer scales of the involucre leaf-like. Pappus of many slender roughish bristles. Akenes narrow. Heads large and broad, the tubular perfect flowers very numerous, their anthers with two tails at the base. Leaves alternate.
33. CHRYSOPSIS. Ray-flowers numerous in one row, scales of the involucre narrow, not leaf-like. Pappus of many roughish slender bristles, with also an outer row of very short and stout or chaff-like bristles. Akenes flattened, hairy. Heads single or corymbed. Leaves alternate.
34. SOLIDAGO. Ray-flowers 1–8, or rarely 10–16, the tubular disk-flowers several, rarely many. Involucre oblong, its scales imbricated and appressed, of unequal lengths. Pappus a row of slender roughish bristles. Akenes narrow, terete, many-ribbed. Heads in panicled racemes, corymbs, or clusters, mostly small. Leaves alternate.

+– +– *Rays white, purple, blue, &c. never yellow, the flowers of the disk mostly yellow.* ASTERS *and the like. Leaves alternate, simple. Akenes flattened or flattish.*

35. CALLISTEPHUS. Ray-flowers very numerous, usually in more than one row, or in cultivated varieties in several rows. Involucre in several rows, more or

less leafy. Pappus of many slender and roughish bristles, surrounded at base by a little cup or crown, consisting of many little scales or short stiff bristles more or less united. Heads solitary terminating leafy stems or branches, large and broad. Leaves sessile, coarsely toothed. Root annual.

36. ASTER. Ray-flowers more or less numerous in one row. Involucre imbricated Pappus of very numerous slender roughish bristles ; no cup or crown of short bristles outside. Heads usually panicled or corymbed. Root usually perennial.

37. ERIGERON. Ray-flowers numerous, narrow, and commonly occupying more than one row. Involucre more simple than in Aster, the scales narrower, appressed, mostly of equal length and occupying only one or two rows, without any leaf-like tips; and the pappus more scanty, often some minute short and sometimes chaff-like bristles at the base of the long ones.

* * *Pappus not of long hair-like bristles, either a little cup or crown, or of a few scales, teeth, awns, &c., or none at all.*

+– *No chaff on the receptacle among the flowers, except in* 41 – 43 *and some cultivated and altered forms of* 44. *Leaves mostly alternate.*

+– +– *Akenes flat: rays pistillate, not yellow, at least in our species.*

38. BOLTONIA. Flowers resembling those of 36 and 37. Receptacle conical or hemispherical. Akenes very flat, obovate or obcordate with a callous margin or wing: pappus of several minute and short bristles, and commonly 2 or 3 short awns. Leafy-stemmed, tall, branching herbs, with pale-green thickish and chiefly entire leaves often turned edgewise.

39. BRACHYCOME. Flowers like those of 36 or 37. Receptacle conical. Akenes flat, wingless: pappus a ring of minute short bristles or narrow scales united into a short crown.

40. BELLIS. Heads with numerous white, reddish, or purple rays. Receptacle high conical. Akenes flat, obovate, wingless: no pappus. Low nerbs, with solitary peduncled heads, and entire or merely toothed leaves.

41. ACHILLEA. Heads mostly with few and white (rarely rose-red or yellow) rays. Receptacle small, flattish, chaffy. Akenes oblong, margined: no pappus.

+– +– +– *Akenes not flat, nor boat-shaped: pappus a short crown or none: rays pistillate and fertile except in* 42.

42. MARUTA. Rays neutral, white; otherwise almost exactly as in the next.

43. ANTHEMIS. Rays pistillate and fertile, numerous, white or sometimes yellow. Involucre of many small close-pressed scales. Receptacle convex, with some slender chaff, at least at the centre. Akenes terete, mostly ribbed. Leaves once to thrice pinnately divided.

44. CHRYSANTHEMUM, including LEUCANTHEMUM and PYRETHRUM. Rays pistillate and fertile, numerous. Receptacle convex or flat, without chaff, except in some double-flowered varieties. Disk-flowers mostly with a flattened tube. Pappus none. Otherwise nearly as in Anthemis.

+– +– +– *Akenes top-shaped or oblong, not flattened nor incurved: pappus of* 5 – 10 *conspicuous thin chaffy scales with midrib more or less extended into a bristle or awn: rays in one row, not very numerous, wedge-shaped,* 3 – 5*-cleft or lobed, yellow or partly reddish or brownish-purple, never white: involucre of separate scales.*

45. HELENIUM. Rays pistillate. Involucre of a few small and narrow spreading or reflexed scales. Receptacle globular or conical. Heads mostly corymbed. (Akene and pappus, Lessons, p. 121, fig. 382.)

46. GAILLARDIA. Rays neutral, often partycolored. Involucre of two or more rows of loose leafy-tipped scales. Receptacle convex. Disk-flowers often purple: the styles with very slender hispid branches. Heads solitary on slender terminal peduncles.

+– +– +– +– *Akenes short, not incurved, covered with extremely long soft-silky hairs (which must not be confounded with pappus), hiding the minute pappus of many delicate little scales: rays numerous in one row, neutral, yellow with dark-colored spot at base, nearly entire: involucre of* 2 *or* 3 *rows of short scales united in a cup.*

47. GAZANIA. Head solitary on a long terminal peduncle, large and showy, the rays expanding only in sunshine or bright daylight. Receptacle flat. Disk-flowers yellow: their style abruptly thickened below the two short branches.

++ ++ ++ ++ ++ *Akenes incurved or boat-shaped, rough-tubercled on the back: no pappus: rays numerous in more than one row: flowers all yellow or orange.*

48. CALENDULA. Heads showy, solitary terminating the branches, with the very numerous rays pistillate and fertile, expanding in sunshine or bright daylight; the disk-flowers sometimes few in the centre and sterile. Involucre of numerous short green scales. Receptacle flat. Akenes all that mature belonging to the ray-flowers, strongly incurved, some of them even horse-shoe-shaped, or coiled into a ring, and (especially the outer ones) with thickened margins.

+– +– *A chaff on the receptacle behind each flower.*

++ *Only the ray-flowers fertile or maturing their akenes; those of the disk, even if apparently perfect, always sterile: flowers all yellow. Coarse tall herbs.*

49. POLYMNIA. Heads rather small or middle-sized, with about 5 leaf-like scales to the involucre, and some thin and small inner ones, few or several ray-flowers producing turgid obovate or partly triangular akenes with no pappus. Herbage clammy-pubescent and rather strong-scented: all but the uppermost leaves opposite, and their petioles winged or dilated and stipule-like at the clasping base.

50. SILPHIUM. Heads mostly large, with numerous somewhat leafy-tipped or green scales to the involucre imbricated in 2 or more rows, numerous ray-flowers producing very broad and flat akenes (parallel with the scales of the involucre), which have commonly a wing-like margin and 2 teeth or a notch at the top. Juice resinous.

++ ++ *Disk-flowers perfect and fertile, those of the ray pistillate and fertile or neutral.*

a. *Akenes flattened parallel with the scales of the involucre and chaff of the receptacle, or in* 53 *sometimes very slender. Leaves generally opposite: involucre double, the outer mostly leaf-like, the inner of erect scales.*

51. DAHLIA. Rays in the natural flowers neutral or in the common species more or less pistillate, but in the gardens most or all of the flowers are changed into rays. Inner involucre of numerous more or less united scales. Akenes oblong, obscurely 2-horned or notched at the apex.

52. COREOPSIS. Rays usually 8, neutral, mostly yellow, or brown-purple at base. Involucre commonly of about 8 outer loose or leaf-like scales and as many erect inner ones. Chaff slender, deciduous with the flat akenes, which have mostly a pappus of 2 teeth or awns, the latter not barbed downwards.

53. BIDENS. Like Coreopsis, but several without rays, and some with slender or needle-shaped akenes; all bear 2 or more rigid persistent awns, which are barbed downwards!

b. *Akenes flattened if at all contrary to the scales of the involucre and the chaff of the receptacle, having the latter usually embracing or folded round their outer margin.*

= *Rays deciduous after flowering, yellow, sometimes brown-purple at base in* 60, 61, *or white in one of* 55. *Leaves either opposite or alternate in same genus, in* 54 – 56.

54. ACTINOMERIS. Rays neutral, few or several. Involucre of several nearly equal scales. Receptacle convex or conical. Akenes flat, oval, wing-margined: pappus of 2 persistent smooth awns. Leaves simple, serrate, often decurrent into wings on the stem.

55. VERBESINA. Rays few (in ours 1 – 5), pistillate. Involucre of few erect scales. Receptacle rather flat. Akenes flat, winged or wingless: pappus of 2 persistent awns. Leaves simple, decurrent into wings on the stem.

56. XIMENESIA. Rays numerous, pistillate. Scales of the involucre spreading. Receptacle flattish or convex. Akenes of the ray wrinkled and wingless; those of the disk flat and wing-margined, with two slender awns united to the wing. Leaves mostly with winged petioles which are dilated and clasping at the base.

57. HELIANTHUS. Rays several or many, neutral. Scales of the involucre imbricated. Receptacle flat or convex. Akenes flattish, more or less 4-angled or lenticular, marginless: pappus of 2 thin chaffy scales corresponding with the outer and inner angle of the akene, and sometimes with minute intermediate ones, all deciduous from the ripe fruit. (Lessons, p. 121, fig. 381.) Leaves simple, entire or serrate: stems not winged.

58. HELIOPSIS. Rays 10 or more, pistillate. Scales of the involucre in 2 or 3 rows, the inner shorter than the disk. Receptacle conical. Akenes 4-angled, somewhat cubical: no pappus. Leaves opposite, petioled, triple-ribbed.

59. RUDBECKIA. Rays several or numerous, neutral. Scales of the involucre in about 2 rows, spreading. Receptacle conical or columnar. Chaff soft. Akenes short, 4-angular, marginless, flat at the top: pappus none or a short even cup-border or border. Leaves alternate.

60. LEPACHYS. Like 59, but akenes flattened, wing-margined on the inner and sometimes on the outer edge, 1 – 2-toothed at summit. Disk grayish. Chaff short and truncate. Leaves alternate, pinnately compound.

61. DRACOPIS. Like 60, but involucre of some very small linear scales, and akenes terete, tapering to base, minutely striate, blunt at top, and the attachment at one side of the base. Leaves alternate, mostly entire, clasping.

= = *Rays rather persistent, long, drooping, pistillate but sterile, rose-purple.*

62. ECHINACEA. Rays numerous. Scales of the involucre narrow and spreading. Receptacle conical; the persistent and rigid spiny-tipped chaff longer than the purplish disk-corollas. Akenes thick and short, 4-sided, and with a toothed border for a pappus. Leaves chiefly alternate, 3 – 5-ribbed.

= = = *Rays persistent on the fruit, becoming dry and papery, broad, pistillate and fertile, of various colors.*

63. ZINNIA. Rays several. Receptacle conical; the oblong chaff not longer than the velvety-tipped disk-corollas. Akenes oblong or linear, flattened, or those of the ray 3-sided; pappus of a chaffy awn or tooth on each angle, or sometimes hardly any. Leaves opposite, sessile, and entire. Heads solitary, terminating the stem or branches.

§ 2. *Herbage, involucres, &c. dotted with large pellucid or colored glands or oil-receptacles imbedded in their substance, making the plants strong-scented: involucre of one row of scales united into a bell-shaped or cylindrical cup: no chaff on the flattish receptacle: flowers yellow or orange.*

64. TAGETES. Rays pistillate. Involucre without bractlets at base. Akenes elongated, flat, somewhat 4-sided: pappus of 2 or more unequal rigid chaffy scales, often united into a tube or cup, sometimes tapering into awns. Herbs very glabrous.

65. DYSODIA. Rays pistillate, mostly short. Involucre with some loose bractlets at the base. Receptacle beset with short chaffy bristles. Akenes slender, 4-angled: pappus a row of chaffy scales dissected into numerous rough bristles, so as to appear at first sight as if capillary. Leaves opposite.

II. Head with all the flowers strap-shaped and perfect. Plants with milky juice. Leaves alternate. (No chaff on the receptacle in any of the following.)

§ 1. *Pappus of many minute chaffy scales, forming a short crown or cup.*

66. CICHORIUM. Head of several blue flowers. Involucre double; the outer of 5 short and spreading, the inner of about 10 erect scales. Akenes short, with broad summit. Stems twiggy, leafy mostly towards the base. (Lessons, p. 93, fig. 267; the akene, p. 121, fig. 380.

§ 2. *Pappus of rather numerous and stout long-plumose bristles.*

67. TRAGOPOGON. Head large, of many yellow or purplish flowers. Involucre of about 12 lanceolate rather fleshy scales in a single row, somewhat united at the base. Akenes terete, slender, roughish, tapering into a long beak, which bears the rigid long-plumed bristles of the pappus, 5 of these longer and naked at the summit. Stems leafy; leaves entire, parallel-veined, clasping at the base.

68. LEONTODON. Head rather small, of many yellow flowers. Involucre of many narrow equal erect scales, and a few short bractlets at base. Akenes spindle-shaped: pappus a single row of tawny plumose bristles. Leaves all at the root or base of the scapes.

§ 3. *Pappus of very many slender, but rather stiff and rough, naked and tawny bristles.*

69. HIERACIUM. Heads small or smallish, of 12 or more yellow flowers. Scales of the involucre unequal and in more than one row. Akenes short, oblong or columnar, not beaked: the fragile bristles of the pappus not very copious. Stems naked or leafy.

70. NABALUS. Heads usually nodding, of 5 – 40 greenish-white or yellowish often purple-tinged flowers. Involucre cylindrical, of 5 – 15 linear scales in a single row and a few short bractlets at base. Akenes cylindrical: pappus of very copious straw-colored or brownish bristles. Stems leafy.

§ 4. *Pappus of extremely copious and fine soft hair-like naked bristles.*

* *Mature akenes with the pappus raised on a very long slender stalk-like beak.*

71. PYRRHOPAPPUS. Head of yellow flowers as in the next; but the pappus rusty red and with a minute ring of soft down underneath it. Stems branching and leafy near the base, the long peduncles naked.

72. TARAXACUM. Head of very many yellow flowers on a slender hollow and wholly naked scape. Involucre double, the inner of numerous narrow scales in a single row, the outer of short loose scales. Akenes terete or spindle-shaped, strongly ribbed and tubercled on the ribs, much shorter than its slender beak which elevates at maturity the soft and white pappus. (Lessons, p. 121, fig. 384.)

73. LACTUCA. Heads of several variously colored flowers. Involucre of several lanceolate or ovate imbricated scales of unequal length. Akenes flat, abruptly contracted into the slender beak which elevates the very white soft pappus. Stems leafy.

* * *Akenes with a short and thick beak or none: heads many-flowered.*

74. MULGEDIUM. Involucre as in 73. Flowers blue or bluish. Akenes flattened, short-beaked. Stems leafy.

75. SONCHUS. Involucre as in 73, or with narrow and more equal scales, and tumid at base. Flowers yellow. Akenes flat and short, without a beak to support its very soft white pappus. Stems branching and leafy. (Lessons, p. 121, fig. 383.)

1. CÝNARA, ARTICHOKE. (Ancient Greek name.) Two species occasionally cult. from the Old World, as esculents. ♃

C. Scólymus, True Artichoke, with stout stems, slightly prickly leaves mostly once or twice pinnatifid and cottony beneath, the ovate and usually pointless scales of the involucre and the receptacle of the young flower heads fleshy, and edible when cooked.

C. Cardúnculus, Cardoon, has the leaves more deeply and compoundly divided and prickly, the less fleshy scales of the head prickly-tipped; the fleshy leafstalks and midrib eaten after being blanched in the manner of celery.

2. CÍRSIUM, TRUE THISTLE. (Old Greek name.) Flowers purple or pink, occasionally yellow or white, in summer. ② ♃

§ 1. *All the scales of the head armed with spreading prickly tips.*

C. lanceolàtum, Common Thistle. Nat. from Eu. in pastures, &c.; the base of the rough deeply pinnatifid leaves running down the stem in lobed prickly wings; fl. purple. ②

§ 2. *All or most of the scales of the head appressed, the innermost not prickly-pointed, the outer with a short prickle or point, or none.*

* *Leaves green both sides or a little cottony or cobwebby underneath.*

C. arvénse, Canada T. A vile pest in fields and meadows N., nat. from Eu.: spreading by deep running roots as well as by seed: numerous short-peduncled heads only 1′ long, with rose-purple flowers; leaves moderately pinnatifid, weak-prickly. ♃

C. horrídulum, Yellow T. Wild near the coast in sandy ground; has very prickly leaves, rather large heads surrounded at base by an involucre or whorl of leaf-like very prickly bracts, and yellowish or purplish flowers.

C. pùmilum, Pasture T. Wild in dry fields, 1° – 3° high, with lance-oblong pinnatifid leaves, single very large heads (almost 2′ across) of fragrant (purple or rarely white) flowers, sometimes leafy-bracted at base. ②

C. mùticum, Swamp T. Wild in swamps and low ground; 3° – 8° high, with deeply divided leaves, few or no prickles, and rather large naked heads, most of the scales pointless; flowers purple. ♃

* * *Leaves white-cottony underneath: flowers purple, rarely white. Wild species.*

C. altíssimum, Tall T. Fields from Penn. and S.; 3° – 10° high, branching, leafy up to the rather small heads, the oblong leaves wavy or only slightly pinnatifid, except the lowest. ② ♃

C. Virginiànum, VIRGINIA T. Chiefly S. & W. on plains and barrens, with rather simple stems 1° – 3° high, ending in a long naked peduncle; leaves lanceolate and slightly or not at all pinnatifid; head small. 2/

C. díscolor, TWO-COLORED T. Low grounds, 3° – 6° high, branching and leafy, with rather small heads, and deeply pinnatifid leaves green above white beneath, their lobes narrow and prickly pointed. ②

3. SÍLYBUM, MILK THISTLE. (An ancient Greek name.)

S. Marianum, the only species, cult. in some gardens and rarely running wild, from the Old World, well marked by its white-blotched or veined smooth leaves with clasping base and merely sinuate prickly margins; flowers purple, in late summer. ① ②

4. ONOPÓRDON, COTTON or SCOTCH THISTLE. (The ancient Greek name.)

O. Acánthium. Nat. from Eu. in waste places: tall, white-cottony, with weak prickles on the sinuate-pinnatifid leaves and the broad leaf-like wings of the stem and branches; flowers purple, late summer. ②

5. LÁPPA, BURDOCK. (Name from a Greek word meaning to *lay hold of,* from the burs or hook-awned heads.)

L. officinàlis, var. MAJOR, the COMMON B., with large leaves loosely cottony beneath, or somewhat naked, the lower heart-shaped, upper ovate, is common in manured soil and barnyards. Var. MÌNOR is smaller and smoother, with leaves tapering at the base, often cut-toothed or cleft. Fl. mostly purple, all summer and autumn. ① ②

6. CÁRTHAMUS, SAFFLOWER, FALSE SAFFRON. (Arabic name of the plant, from the properties of the orange-colored flowers, which are used in dying or coloring yellow, as a substitute for true Saffron.)

C. tinctòrius, the only common species, cult. in country gardens, from the Orient; smooth, 6′ – 12′ high, with ovate-oblong leaves and large head, in summer. ①

7. CNÌCUS, BLESSED THISTLE. (Greek name of a kind of Thistle.)

C. benedíctus, the only species, scarce in waste places S., from Eu.; has much branched loosely woolly stems, leafy up to the rather small heads of yellowish flowers, and pale pinnatifid leaves with slightly prickly edges.

8. CENTAURÈA, CENTAUREA or STAR-THISTLE. (Ancient name, after *Chiron the Centaur.*) Fl. summer.

§ 1. *Flowers all alike in the head, the marginal ones not enlarged and ray-like: pappus of very short bristles: scales of head with dark-fringed appendage.*

C. nigra, BLACK C. or KNAPWEED. A coarse weed, in fields and waste places E., nat. from Eu.; stem 2° high; leaves roughish, lance-oblong, the lower with some coarse teeth; flowers purple. 2/

§ 2. *Marginal flowers more or less enlarged, forming a kind of false ray, and sterile: pappus of bristles: scales of head with fringed appendage.*

C. Cinerària, or CANDIDÍSSIMA, a low species, cult. from S. Eu. with very white-woolly twice pinnatifid leaves, and purple flowers, the outermost little enlarged: not hardy N. 2/

C. Americàna. Cult. from Arkansas and Texas: smooth, with stout stem 1° – 2° high, oblong or lance-oblong leaves, the upper entire, very large head of showy pale purple flowers, the outer ones much enlarged, and the scales with large scarious-fringed appendage. ①

C. Cyanus, BLUEBOTTLE or CORNFLOWER. In gardens, from Eu., sparingly running wild; loosely cottony, with stem-leaves linear and mostly entire,

solitary long-stalked head, the outer flowers very large and blue, with white or rose-colored varieties. ① ②

C. montàna. Cult. from Eu.: low and stout stems from creeping root-stock, leaves lance-oblong, head larger, but flowers similar to last. ♃

§ 3. AMBERBÒA. *Marginal sterile flowers many: pappus of narrow chaff, or none: scales of head naked and smooth.* Cult. for ornament, from Asia.

C. odoràta, or AMBERBOI, SWEET SULTANA. Smooth, with mostly pinnatifid leaves, long-stalked head of yellow fragrant flowers, the outer ranks enlarged, and chaffy-bristled pappus. ①

C. moschàta, MUSK-SCENTED S., has rose-purple or white musk-scented flowers, the outer little enlarged, and no pappus. ①

9. XÁNTHIUM, COCKLEBUR, CLOTBUR. (Name from the Greek for *yellow*, the plants said to yield that color.) Coarse and vile weeds, with stout and low branching stems, alternate and petioled merely toothed or lobed leaves, and obscure greenish flowers, produced all summer. ①

X. strumàrium, COMMON C. Barnyards and waste manured ground: rough, 1° – 2° high, with broadly triangular-heart-shaped toothed or slightly lobed leaves on long petioles; the fruit a bur fully ½′ long, with 2 straightish beaks at the apex.

Var. **echinàtum,** on sandy shores, has a turgid bur 1′ long, with incurved beaks and more numerous prickles, beset with glandular bristles.

X. spinòsum, SPINY C. Sandy shores and waste places, E. & S. Hoary; the branching stems armed with slender triple prickles at the base of the narrow short-petioled leaves; bur small, with a single beak-like tip.

10. AMBRÒSIA, RAGWEED. (The classical name means *food for the Gods:* perhaps sarcastically applied to these miserable weeds.) Leaves opposite or the upper alternate, mostly lobed or cut: flowers greenish, all summer and autumn. ①

A. trífida, GREAT RAGWEED. Tall coarse herb along low borders of streams, 4° – 10° high, rough, with opposite deeply 3-lobed leaves on margined petioles, the lobes lance-ovate and serrate, staminate heads in racemes, their involucres 3-ribbed on one side, the fertile one or fruit obovate and with 5 or 6 ribs ending in a tubercle or spiny point.

A. bidentàta. Prairies from Ill. S., 1° – 3° high, hairy, very leafy; the leaves alternate, closely sessile, lanceolate, and with a short lobe or tooth on one side near the base; heads in a dense spike, the top-shaped involucre of the sterile ones with a large lanceolate appendage on one side.

A. artemisiæfòlia, ROMAN WORMWOOD, HOGWEED, or BITTERWEED. Waste places and roadsides, 1° – 3° high, hairy or roughish; with twice pinnatifid leaves either opposite or alternate, pale or hoary beneath, staminate heads in panicled racemes or spikes, the small roundish fruit with about 6 little teeth or spines.

11. TANACÈTUM, TANSY. (Old name, said to be a corruption of *Athanasia,* undying, from the durable flowers.) Fl. all summer. ♃

T. vulgàre, COMMON TANSY, from Eu.: cult. in old gardens, and a roadside weed, 2° – 4° high, smooth, strong-scented and acrid, with deep green 1 – 3-pinnately compound leaves, the leaflets and winged margins of the petiole cut-toothed; in var. CRÍSPUM, leaves more cut and crisped.

T. Balsamìta, COSTMARY: a garden herb, from Eu., 1° – 2° high, smooth, with pleasant scent, the pale leaves oblong and nearly toothed, and small heads of pale yellow flowers.

12. ARTEMÍSIA, WORMWOOD. (Dedicated to *Ártemis,* the Greek Diana.) Fl. summer.

* *Leaves hoary or cottony, at least underneath.* ♃

A. Absínthium, COMMON WORMWOOD, from Eu.; in old gardens and a roadside weed; strong-scented, silky-hoary, with stems 2° – 4° high and rather

woody at base, twice or thrice pinnately parted leaves with lanceolate lobes, and nodding hemispherical heads.

A. vulgàris, MUGWORT of Eu.; in old gardens and roadsides, with pinnatifid leaves green above and cottony-white beneath, their lance-linear divisions mostly cut and cleft, and small heads in open panicles.

A. Ludoviciàna, WESTERN M., is wild from Michigan W. and S. W., with lanceolate leaves mostly cottony-white on both sides, many of them entire or merely toothed, and larger heads in narrow or spike-like panicles.

* * *Leaves (and whole plant) smooth and green or nearly so,*

+ *Not very fine or finely cut.*

A. biénnis, BIENNIAL WORMWOOD. Gravelly banks and shores N. W., extending E. along railroads; 1° – 3° high, with small greenish heads much crowded in the axils the once or twice pinnatifid leaves, their lobes linear, in the lower cut-toothed. ① ②

A. Dracúnculus, TARRAGON, is sparingly cult. from Eu. for the aromatic (lance-linear entire) leaves, used as a condiment. 2

+ + *Very fine thread-like or capillary divisions to the* 1 – 3*-pinnately divided leaves: heads loosely panicled.*

A. Abrótanum, SOUTHERNWOOD, from S. Eu.; cult. in gardens for the pleasant-scented foliage, 3° – 5° high, woody-stemmed. 2

A. caudàta, is a wild Wormwood along the sandy coast and lake shores, 2° – 4° high. ②

13. FILÀGO, COTTON-ROSE. (Latin name, from the cottony hairs.)

F. Germánica, GERMAN C. or HERBA IMPIA of the old herbalists, branches with a new generation of clustered heads rising out of the parent cluster at the top of the stem (as if undutifully exalting themselves); stems 5′ – 10′ high, crowded with the lanceolate erect and entire cottony leaves. Old dry fields from New York S.; fl. summer and autumn. ①

14. ERECHTHÌTES, FIREWEED. (Ancient name of some Groundsel, after *Erechtheus*.) Fl. summer and autumn. ①

E. hieracifòlia, one of the plants called FIREWEED, because springing up where woods have been cleared and ground burned over, especially N.: very rank and coarse herb, often hairy, 1° – 5° high, with lanceolate or oblong cut-toothed leaves, the upper with auricled clasping base, and panicled or corymbed heads of dull white flowers, in fruit with copious white and very soft downy pappus.

15. GNAPHÀLIUM, EVERLASTING, IMMORTELLE, CUDWEED. (Name from Greek, meaning *lock of wool.*) Fl. summer and autumn.

§ 1. *Wild species, with crowded small heads, the slender pistillate flowers very numerous and occupying several rows.*

* *Scales of the involucre white or yellowish-white: stem erect,* 1° – 2° *high: heads many, corymbed. Common in old fields, copses, &c.*

G. polycéphalum, COMMON EVERLASTING. Leaves lanceolate, with narrowed base and wavy margins, the upper surface nearly naked; the perfect flowers few in the centre of each head. ①

G. decúrrens, DECURRENT E., equally common from New Jersey to Michigan and N.; leaves lance-linear, cottony both sides, the base partly clasping and extending down on the stem; many perfect flowers in the centre of each head. 2

* * *Scales of the involucre tawny-purplish or whitish, not at all showy or petal-like: heads small, crowded in sessile clusters: stems spreading or ascending,* 3′ – 20′ *high.* ①

G. uliginòsum, LOW CUDWEED. A most common, insignificant little weed in wet places, especially roadsides, with lanceolate or linear leaves, and inconspicuous heads in terminal clusters.

G. purpùreum, Purplish C. In sand or gravel along and near the sea-shore: taller, with oblong-spatulate or lanceolate leaves green above and white-cottony beneath, and purplish heads in axillary clusters, or spiked along the upper part of the stem.

§ 2. *Ornamental exotic* Immortelles *in the gardens, these in strictness named* Helichrysum, *with pistillate flowers fewer or in a single marginal row.*

G. bracteàtum, or Helichrysum bracteatum, from Australia: tall, smoothish or slightly downy, with lanceolate leaves, large heads terminating the branches and with some leaf-like bracts on the peduncle, the permanent and very numerous scales of the involucre very showy and petal-like, spreading in many ranks, golden yellow, and with white varieties. ② ①

G. (or **H.**) **macránthum,** from Australia, is less tall (1° – 2° high), with roughish stem and lance-oblong or spatulate leaves green throughout, and the showy solitary heads nearly 2′ across; the scales of the involucre rose-red, or white on the upper face. ♃ ①

16. ANTENNÀRIA, EVERLASTING, IMMORTELLE. (Name from the club-shaped pappus of the staminate flowers, which resembles the *antennæ* of certain insects.) ♃

A. margaritàcea, Pearly Everlasting. Dry fields and woods, especially N., fl. in summer: stem about 2° high, leafy to the top; the leaves lance-linear; heads in a broad corymb, the fertile ones with a few imperfect staminate flowers in the centre; scales of the involucre pearly white, rounded.

A. plantaginifòlia, Plantain-leaved E. Dry knolls and slopes, fl. early spring: in patches, spreading by runners and offsets; the root-leaves spatulate or obovate and tufted; flowering stems 4′ – 8′ high, with few and small lanceolate leaves; heads in a small corymb, the fertile ones with narrow and acutish, the staminate with white and rounded scales.

17. RHODÁNTHE. (Name from Greek words for *rose* and *flower,* from the rose-colored pearly heads, which in cultivation are sometimes white.) ①

R. Manglèsii, cult. in gardens for ornament, from Australia: a low smooth herb, with oblong and alternate clasping entire leaves, and loosely corymbed showy nodding heads of yellow flowers, the pearly involucre obovate or obconical, smooth, rose or white, very ornamental, in summer.

18. AMMÒBIUM. (Name from Greek words meaning *living in sand.*) ①

A. alàtum, of Australia, cult. for ornament: 1° – 3° high, rather cottony, with root-leaves oblong and tapering downwards into a petiole, stem-leaves small and lanceolate, and extended down the branches and stems in the form of leaf-like wings; heads solitary with pearly white involucre surrounding yellow flowers.

19. HÙMEA. (Named for Lady Hume.) From Australia, cult. for ornament. ①

H. élegans. Tall, 3° – 6° high when in flower, with simple stem thickly set with the alternate lance-ovate and clasping green leaves, the summit branching into a large drooping panicle, its branches slender, bearing very numerous and small purplish heads.

20. VERNÒNIA, IRON-WEED. (Named for a *Mr. Vernon,* of England, who travelled in this country.) Fl. autumn. ♃

V. Noveboracénsis, New York or Common Iron-Weed. Near the coast and along rivers: 3° – 6° high, with lanceolate serrate leaves, crowded along the whole height of the stem, heads in a broad corymb, and scales of involucre with slender awl-shaped or awn-like tips.

V. fasciculàta, only W. & S. in prairies, &c., has the scales of involucre blunt and pointless, except perhaps some of the lowest.

V. angustifòlia, only S., has narrow linear and more scattered leaves.

21. LIATRIS, BUTTON-SNAKEROOT or BLAZING-STAR. (An unexplained name.) Chiefly in pine-barrens or sandy soil. Fl. late summer and autumn. 2

§ 1. *Stem commonly wand-like and simple, rising from a round corm or short tuber, very leafy with narrow and entire often grass-like leaves: heads spiked or racemed, or occasionally branching into a panicle, with imbricated involucre: lobes of the rose-purple corolla long and slender.*

* *Bristles of the pappus plainly plumose to the naked eye.*

← *Heads small, only 4–5-flowered.*

L. tenuifòlia, in S. pine-barrens, has very slender mostly thread-shaped leaves, stem 2°–4° high, very slender raceme, and scales of involucre erect and pointed.

L. élegans, from Virginia S.; 2° high, often hairy or downy, with compact spike, short lanceolate or linear leaves, and scales of involucre with spreading rose-purple tips.

← ← *Heads large and fewer, cylindrical, many-flowered.*

L. squarròsa, COMMON BLAZING-STAR; from Penn. S. & W.; 1°–5° high, with linear leaves, few heads about 1′ long, and scales of involucre with spreading leaf-like tips.

L. cylindràcea, from W. Canada S. W., smaller than the preceding, 6′–18′ high, the narrow heads with short and rounded appressed tips.

* * *Bristles of the pappus not plainly plumose to the naked eye.*

← *Heads 30–40-flowered, commonly an inch broad.*

L. scariòsa, with stout stem 2°–5° high, lanceolate leaves, or the lower spatulate-oblong, and very numerous scales of the involucre with rounded tips, often scarious or purple on the margins.

← ← *Heads 3–15-flowered, from ¼′ to ½′ long: stem 2°–5° high.*

L. pycnostàchya, in prairies W., with linear or lance-linear leaves, and a very dense spike of about 5-flowered heads, the scales of the involucre with recurving purplish tips.

L. spicàta, the commonest species; in low grounds, with 8–12-flowered heads crowded in a long spike, the oblong and blunt scales of involucre without any obvious tips.

L. graminifòlia, in wet pine-barrens from New Jersey S., has 7–12-flowered heads in a looser spike or raceme, the rigid appressed scales blunt or slightly pointed.

L. grácilis, from N. Carolina S., with spreading leaves, the lower lance-oblong and long-petioled, the others linear and short, and 3–7-flowered small heads on spreading pedicels.

§ 2. *No tuber or corm: leaves broad: heads small, in a corymb.*

L. odoratíssima, VANILLA-PLANT of low pine-barrens S. (also wrongly called HOUND'S-TONGUE): 2°–3° high, very smooth, with pale obovate or oblong leaves which are vanilla-scented in withering, the heads 7–8-flowered, involucre of few scales, and pappus not plumose.

22. KÙHNIA. (Named by Linnæus for *Dr. Kuhn* of Pennsylvania.)

K. eupatorioides, the only species from New Jersey to Wisconsin S., is a rather homely herb, with lanceolate leaves, and panicled or corymbed small heads of flowers, in autumn. 2

23. MIKÁNIA, CLIMBING HEMPWEED. (Named for a Bohemian botanist, *Prof. Mikan.*)

M. scándens, a rather handsome plant, climbs over bushes in low grounds, with triangular-heart-shaped or halberd-shaped leaves, and small heads of purplish flowers, in summer. 2

24. EUPATÒRIUM, THOROUGHWORT, BONESET. (Old name, dedicated to *Eupator Mithridates,* who is said to have used the European species in medicine. Most of the species are American.) 2l

E. glechonophýllum, of Chili, and one or two other somewhat woody-stemmed and white-flowered species are cultivated in greenhouses for winter-blooming. — The following are the commonest wild species; fl. late summer and autumn.

§ 1. *Leaves 3 – 6 in a whorl: heads 5 – 15-flowered, cylindrical, the purplish scales closely imbricated in several rows: flowers flesh-colored.*

E. purpùreum, PURPLE T. or JOE-PYE WEED. Low grounds, with simple stems 3° - 12° high, with or without purplish spots or dots, very veiny oblong-ovate roughish-toothed and pointed leaves on petioles, and dense compound corymbs.

§ 2. *Leaves opposite (or only the uppermost alternate) and sessile: heads corymbed, the scales more or less imbricated: flowers white.*

* *Leaves united at base around the stem in pairs (connate-perfoliate).*

E. perfoliàtum, THOROUGHWORT or BONESET. Low grounds everywhere (the bitter infusion used as a popular medicine), 2° – 4° high, hairy; the lanceolate leaves taper-pointed, serrate, very veiny and somewhat wrinkled, 5′ – 8′ long; the very numerous heads crowded in a dense corymb, 10 – 30-flowered.

* * *Leaves separate at base: heads mostly 5 – 8-flowered.*

E. sessilifòlium, on shady banks, is smooth, 4° – 6° high, with lance-ovate serrate leaves (3′ – 6′ long) tapering from a rounded closely sessile base to a slender point, and small heads in very compound flat corymbs.

E. pubéscens, in dry soil chiefly near the coast, only 2° high, with ovate acute and toothed downy leaves, and 7 – 8 flowers in the heads.

E. rotundifòlium, in similar places and like the foregoing, but with roundish-ovate blunt leaves more deeply toothed, and 5-flowered heads.

E. teucrifòlium, in low grounds near the coast, roughish-pubescent, with ovate-oblong or lance-oblong veiny deeply few-toothed leaves and small corymbs.

E. álbum, in sandy soil from New Jersey S., 2° high, is roughish-hairy, with oblong-lanceolate coarsely toothed and strongly veiny leaves, and heads crowded in the corymb, the lanceolate and pointed scales of the involucre white above and larger than the flowers.

E. altíssimum, in dry soil from Penn. to Ill. and S., is stout and tall, 3° – 7° high, downy, with lanceolate leaves (resembling those of some Golden-rods) tapering to both ends and conspicuously 3-nerved, either entire or toothed above the middle; corymbs dense; scales of the involucre blunt.

E. hyssopifòlium, in dry, sterile soil, from Mass. S., 1° – 2° high, smoothish, with narrow linear or lanceolate blunt 1 – 3-nerved leaves.

§ 3. *Leaves alternate or the lower opposite, all long-petioled: corymbs compound: flowers 12 – 15 in the head, small, white.*

E. serótinum, in low grounds from Maryland to Ill. & S., minutely pubescent, tall (3° – 6° high), bushy-branched; leaves ovate-lanceolate and taper-pointed, triple-ribbed, coarsely toothed, 5′ – 6′ long; the involucre very downy.

§ 4. *Leaves opposite, petioled, triple-ribbed: heads in corymbs, 8 – 30-flowered, the scales of the involucre equal and almost in one row: flowers white.*

E. ageratoìdes, WHITE SNAKE-ROOT. Common in woods, especially N., 2° – 3° high, smooth, with broadly ovate long-petioled coarsely and sharply toothed thin leaves (4′ – 5′ long), and heads of handsome pure-white flowers in compound corymbs.

E. aromáticum, like the preceding, but commoner S. and only near the coast; more slender, usually less smooth, with thicker leaves more bluntly toothed on short petioles, the corymbs usually less compound.

25. CONOCLÍNIUM, MIST-FLOWER. (Name from Greek, means *conical receptacle,* in which alone it differs from Eupatorium, i. e. from such species as those of the last section.) 2

C. cœlestìnum, in rich soil from Penn. to Ill. and S., sometimes cult. for ornament, 1° – 2° high, with triangular-ovate or slightly heart-shaped coarsely toothed leaves, and a flat corymb of small heads of blue-purple flowers, in autumn.

26. AGÉRATUM. (An ancient Greek name, which means *not growing old,* probably applied originally to some sort of Everlasting.)

A. conyzoìdes, the variety with azure-blue flowers called A. Mexicànum, cult. for ornament from Trop. Amer.; 2° – 3° high, soft-downy, with ovate or somewhat heart-shaped petioled leaves, and corymbed heads of azure-blue flowers, produced all summer and autumn. ①

27. PIQUÈRIA. (Named for an obscure Spanish botanist, *Piquerio.*)

P. trinérvia, from Mexico, cult. for winter-blooming; smooth, 2° – 3° high, branched, with lance-oblong 3-nerved sparingly serrate leaves, and loose panicled corymbs of very small white-flowered heads; much used for dressing larger cut flowers. ①

28. CACÀLIA, INDIAN PLANTAIN. (Ancient name, of uncertain meaning.) Natives of rich soil, fl. mostly in late summer. 2

* *Receptacle flat: involucre with some bracts at the base.*

C. suavèolens, from Conn. to Wisconsin and S., but rare; 3° – 5° high, with halberd-shaped serrate leaves on winged petioles, and rather large heads of 20 – 30 flowers.

* * *Receptacle pointed in the middle: involucre 5-flowered, of 5 scales, naked.*

C. renifórmis, Great I., from New Jersey to Illinois and S. along the mountains, 4° – 9° high, with large and green repand-toothed petioled leaves, the lower kidney-shaped, the upper fan-shaped.

C. atriplicifòlia, Pale I. Commoner S.: pale or glaucous, with coarsely toothed or angled leaves, the lower almost kidney-shaped, the upper wedge-shaped.

C. tuberòsa, Tuberous I. Wet prairies W., with angled stem and green thickish 5 – 7-nerved mostly entire leaves, the lower lance-oval and tapering into long petioles, the upper short-petioled. Flowers in early summer.

29. TUSSILÀGO, COLTSFOOT. (Name from the Latin *tussis,* a cough, for which the plant is a popular remedy.) 2

T. Fárfara, the only species, is wild along brooks, damp roadsides, and near dwellings N., probably introduced from Europe, spreading very much by its creeping (mucilaginous and bitter) rootstocks, which send up, in earliest spring, scaly-bracted scapes, 3′ – 6′ high, bearing a single Dandelion-like head, followed by the rounded and somewhat angled or toothed heart-shaped or kidney-shaped leaves, which are cottony beneath when young.

30. SENÈCIO, GROUNDSEL. (Name from the Latin *senex,* an old man, referring to the hoary hairs of many species, or to the white hairs of the pappus.)

§ 1. *Wild species, chiefly of low or wet grounds, with yellow flowers.*

* *No ray-flowers, introduced from Eu.: fl. all summer.* ①

S. vulgàris, Common Groundsel; a low weed in waste or cultivated grounds E., corymbose, nearly smooth, with pinnatifid and toothed leaves.

* * *With ray-flowers, native herbs: fl. spring and early summer.*

S. lobàtus, Butterweed. Low banks of streams S. & S. W., very smooth, 1° – 3° high, with tender lyrate-pinnatifid or pinnate and variously lobed leaves, small heads in naked corymbs, and about 12 conspicuous rays. ①

S. aùreus, Golden Ragwort or Squaw-weed. Cottony when young, becoming smooth with age, sometimes quite smooth when young, with simple stems 1° – 3° high, root-leaves simple and in different varieties either round, obovate, heart-shaped, oblong, or spatulate, crenate or cut-toothed, on slender petioles, lower stem-leaves lyrate, upper ones sessile or clasping and cut-pinnatifid; corymb umbel-like; rays 8 – 12. ♃

§ 2. *Exotic species, cultivated for ornament from the Old World.*

* Emília, *or* Cacàlia, *of the older botanists, with no rays, but many orange-red disk-flowers in a very simple cup-like involucre: akenes with 5 acute and hispid-ciliate angles.* ①

S. sonchifòlia, Tassel-Flower: cult. as a summer annual, from India, very smooth or a little bristly, pale or glaucous, 1° – 2° high, with root-leaves obovate and petioled, stem-leaves sagittate and partly clasping, and rather showy heads in a naked corymb, in summer.

* * *Heads with no rays and only* 6 – 12 *disk-flowers, small, yellow: stem extensively climbing, more or less twining.*

S. scándens, cult. as house plant under the name of German Ivy, but is from Cape of Good Hope, and resembles Ivy only in the leaves, which are round-heart-shaped or angled and with 3 – 7 pointed lobes, soft and tender in texture, and very smooth: the flowers seldom produced. ♃

* * * Cineraria. *Heads with rays and numerous disk-flowers: not climbers.*

+ *Flowers all yellow.* ♃

S. Cinerària, or Cinerària maríTIMA, of Mediterranean coast, an old-fashioned house-plant, ash-white all over (whence the name *Cineraria* and the popular one of Dusty Miller) with a woolly coating; the branching stems somewhat woody at base; leaves pinnately parted and the divisions mostly sinuate-lobed; the small heads in a dense corymb.

S. Kæmpferi, of Japan and China, is most probably the original of the Farfùgium gránde, lately introduced into the gardens, where it hardly ever flowers: it is cultivated for the foliage, the thick and smooth rounded and angled rather kidney-shaped root-leaves blotched with white; some of the flowers more or less 2-lipped. ♃

+ + *Ray-flowers purple, violet, blue, or varying to white, those of the disk of similar colors or sometimes yellow.*

S. Heretièri, or Cinerària lanàta, from Teneriffe, with woody base to the stem, rounded heart-shaped 5 – 7-lobed leaves on slender petioles, very white-cottony beneath but soon smooth and green above, and peduncle bearing solitary rather large head of purple flowers, is a less common house-plant than the next. ♃

S. cruéntus, the Common Cineraria of the greenhouses, from Teneriffe, is herbaceous, smoothish, with the heart-shaped and angled more or less cut-toothed leaves green above and usually crimson or purple underneath, the lower with wing-margined petioles dilated into clasping auricles at the base; heads numerous in a flat corymb, the handsome flowers purple, crimson, blue, white, &c. ♃

S. élegans, Purple Ragwort, from Cape of Good Hope, a smooth herb, with deeply pinnatifid leaves, the lower petioled, the upper with half clasping base, the lobes oblong and often sinuate-toothed; heads corymbed, with yellow or purple disk-flowers and purple or rarely white rays. ① And a full-double variety, having the disk-flowers turned into rays. ♃

31. ÁRNICA. (Old name, thought to be a corruption of *Ptarmica.*) The common European species is used in medicine. The following probably has similar properties. ♃

A. nudicaùlis, so called for the naked stem, which bears only 1 or 2 pairs of small leaves, although 1° – 3° high, the main leaves being clustered at the root, thickish, sessile, ovate or oblong, 3 – 5-nerved, mostly entire, hairy; heads several, loosely corymbed, pretty large and showy, in spring. Low pine-barrens from S. Penn. S.

32. ÍNULA, ELECAMPANE. (Ancient Latin name.) Fl. summer. 2

I. Helènium, Common Elecampane. In old gardens and nat. from Eu. by roadsides; a stout herb, with stems 3° – 5° high from a thick mucilaginous root (used in medicine), large entire leaves woolly beneath, those from the root ovate and petioled, the others partly clasping; heads large, but the rays very narrow.

33. CHRYSÓPSIS, GOLDEN ASTER. (Name from two Greek words meaning *golden in appearance*, from the yellow flowers.) Low herbs, wild chiefly S. & W., in dry and barren or sandy soil: fl. summer and autumn.

C. graminifòlia, from Delaware S.: silvery-silky, with long lance-linear and grass-like shining nerved leaves, and single or few heads. 2

C. falcàta, on the coast, from Cape Cod to New Jersey: only 4′ – 10′ high, woolly, clothed to the top with short and linear 3-nerved rigid leaves, which are often curved or scythe-shaped (whence the specific name); heads small, corymbed. 2

C. gossýpina, from Virginia S.: white-cottony all over (whence the name), with oblong obtuse rarely toothed leaves, and few pretty large heads. 2

C. Mariàna, the commonest species, from Long Island S.: silky with long and weak hairs, or smoothish when old, with oblong leaves, and a few corymbed heads on glandular peduncles. 2

C. villòsa, from Wisconsin S. & W.: coarsely hairy and somewhat hoary, leafy to the top, with corymbed branches bearing single heads on short peduncles, and narrow-oblong leaves. 2

34. SOLIDÀGO, GOLDEN-ROD. (Old name, from Latin word *to make whole*, from supposed healing qualities.) There are very many species, flowering through late summer and autumn. See Manual and Chapman's S. Flora. The following are a few of the very commonest. 2

§ 1. *Heads clustered in the axils of the feather-veined leaves.*

S. bícolor. Pale and downy or hairy, with oblong or lance-oblong scarcely toothed leaves, and small heads with cream-colored or nearly white ray-flowers!

S. latifòlia, of shaded banks N.: smooth, with broadly ovate pointed and sharply serrate thin leaves, and bright yellow ray-flowers.

S. cæsia is like the last, but with more branched and glaucous stems, and lanceolate or lance-oblong sessile leaves.

§ 2. *Heads in racemes forming a terminal panicle.*

* *Leaves feather-veined, not 3-ribbed.*

S. argùta. Smooth, with the lowest and root-leaves oblong or lance-oval pointed and sharply toothed, the upper narrower and entire; the slender one-sided naked racemes widely spreading or drooping.

S. altíssima, badly named, as it is mostly only 2° – 4° high, one of the earliest-flowering Golden-rods, with rough-hairy stem, small lance-ovate or oblong and serrate very veiny leaves, and one-sided recurving racemes of small heads of bright-yellow flowers.

* * *Leaves feather-veined and indistinctly triple-ribbed, entire or nearly so, grayish.*

S. nemoràlis, in dry open ground, flowering soon after midsummer, only 1° – 2° high, pale with very minute down; the leaves spatulate-oblong or oblanceolate; one-sided dense racemes numerous and at length recurving, and flowers bright golden-yellow.

* * * *Leaves plainly either 3-ribbed or triple-ribbed: racemes one-sided, crowded, spreading or recurving and forming an ample panicle.*

S. Canadénsis, has rough-hairy stems, lanceolate and usually serrate pointed leaves rather downy beneath but rough above, and small heads with short rays.

S. gigantèa is smooth or smoothish, especially the stem, and with larger heads and rays than the preceding.

§ 3. *Heads much crowded in a terminal compound corymb.*

S. rígida, in dry soil, a tall and stout species, minutely hoary-downy and roughish, the thick oval or oblong leaves with a strong midrib; the remarkably large heads as many as 30-flowered.

S. lanceolàta, along river-banks, only 2° – 3° high, very bushy-branched, nearly smooth, with lance-linear 3 – 5-nerved leaves, and dense flat corymbs of small heads sessile in clusters, the small rays 15 – 20, the disk-flowers fewer.

S. tenuifòlia, in sandy ground, usually near the coast; like the preceding, but more slender, with narrow linear mostly 1-nerved dotted leaves, and narrower or club-shaped heads, the small rays 6 – 12.

35. CALLÍSTEPHUS, CHINA-ASTER. (Name from Greek words meaning *beautiful crown.*) Fl. all summer. ①

C. Chinénsis, the well-known China-Aster, of the gardens, a native of China and Japan, has numerous varieties of various colors, the finest full-double.

36. ÁSTER, STARWORT, ASTER. (Name, *aster,* a star.) This vast genus (with which Sericocárpus and Diplopáppus may be here included) is too difficult for beginners, and those who are prepared for their study will naturally use the Manual for the northern species, and Chapman's Southern Flora for the few that are peculiarly southern. We barely mention the commonest and more distinct or striking of our 40 or 50 wild species. Fl. late summer and autumn. ♃

§ 1. *With heart-shaped and petioled leaves, at least the lower ones.*

* *Heads in open corymbs, middle-sized: rays white or nearly so and rather few. In woodlands, rather early-flowering.*

A. corymbòsus, Corymbed Aster. Rather slender, with thin coarsely-toothed and sharp-pointed leaves, which are considerably longer than broad, and only 6 – 9 rays.

A. macrophýllus, Large-leaved A. Larger and stouter, 2° – 3° high, with broader and thickish rather rough leaves, and more rigid corymbs of larger heads, with 12 – 24 rays.

* * *Heads panicled, numerous and small. In woodlands, &c.*

A. cordifòlius, Heart-leaved A., is smooth or smoothish, much branched, with thinnish serrate leaves on slender petioles, and very numerous loosely panicled small heads, the rays pale blue or whitish.

A. undulàtus, Wavy-leaved A., is minutely downy, with the leaves only slightly toothed or wavy, the lowest heart-shaped and on margined petioles, the upper abruptly contracted into short and broadly winged petioles with dilated and clasping base, or else sessile by a heart-shaped base; the heads larger and in narrow or raceme-like panicles, and with rather showy purple-blue rays.

§ 2. *With lower leaves never heart-shaped, the upper ones sessile and partly clasping by a heart-shaped or auricled base: heads large or rather large, showy, the numerous rays purple or blue.*

* *Scales of the involucre not at all leafy, but with short greenish tips, rigid, close-pressed in many ranks, the outer successively shorter: rays deep-colored: leaves entire or nearly so. Dry grounds.*

A. pàtens, Spreading A. Rough with short hairiness, 1° – 3° high, with long widely spreading branches, and single large heads terminating the slender minutely-leaved branchlets; all the stem-leaves clasping, usually lance-oblong or lance-ovate, the larger ones often contracted above the heart-shaped base, rough-edged; rays deep purple-violet.

A. lævis, Smooth A. Well-known by its perfect smoothness, pale, often glaucous, with lanceolate or lance-ovate leaves, heads middle-sized in a rather close panicle, involucre of close-pressed whitish scales with abrupt green tips, and rays sky-blue.

* * *Scales of the involucre not leafy but loose and slender, all of about the same length, clammy-glandular, leaves entire.*

A. Novæ-Ángliæ, New England A., but everywhere common in low grounds; the stout hairy stem 4° – 8° high, thickly beset to the top with lanceolate minutely downy leaves, which all have an auricled clasping base; heads many and large in a crowded corymb; the rays very numerous and narrow, violet-purple, or in var. RÒSEUS rose-purple or reddish.

* * * *Scales of the involucre about equal in length, loose and with more or less leaf-like spreading tips, or the outermost wholly green: leaves serrate in the middle or sometimes nearly entire: heads loosely corymbed or panicled. Low grounds.*

A. prenanthoìdes. In rich woodlands chiefly N. & W.; only 1° – 2° high, almost smooth, with lance-ovate leaves coarsely toothed in the middle, tapering above into a long point, and below into a portion narrower than the abruptly dilated heart-shaped clasping base; rays pale blue.

A. puníceus, Red-stemmed A. In wet grounds, mostly 3° – 6° high, loosely branched, rough-hairy, commonly purple-tinged, with lance-oblong or lanceolate sparingly serrate rough leaves, the base auricled and partly clasping; scales of involucre slender; rays long, bright or pale blue.

A. longifòlius, Long-leaved A. Smooth or nearly so, 1° – 4° high, with lanceolate or linear often entire taper-pointed rather firm and glossy leaves, more leaf-like scales to the involucre, and bright blue-purple rays.

§ 3. *With leaves none of them heart-shaped, those of the stem all sessile: heads very small and numerous, racemed or panicled: involucre imbricated in few or several rows: the scales with green tips, the outer successively shorter.*

* *In dry open ground, about* 1° *high: rays white: scales of the involucre rigid and whitish, with abrupt and spreading conspicuous green tips.*

A. ericoìdes, Heath-like A. Smooth or rather hairy, with lanceolate or linear-awl-shaped leaves acute at both ends, and scales of the involucre broadest at base, the green tips acute.

A. multiflòrus, Many-flowered A. Very common in sterile dry soil, pale or slightly hoary with fine close down, much branched and bush-like, with spreading linear leaves rough or ciliate on their margins, the upper sessile or partly clasping by a broad base; scales of involucre spatulate, the green tip shorter than the whitish lower portion.

* * *In low, moist, or shady places,* 1° – 3° *high: scales of involucre with short and close-pressed green or greenish tips.*

A. Tradescánti. Nearly smooth, with slender stems, linear or lance-linear leaves, and very small and numerous heads closely racemed along the upper side of the flowering branches, the scales of the involucre narrow linear and acute; rays white.

A. miser. Rather hairy, with lanceolate or lance-oblong thin leaves tapering to each end and sharply toothed about the middle, heads loosely racemed or scattered on diverging branches, and with linear rather blunt scales of the involucre; rays pale blue-purple or white.

A. dumòsus, Bushy A. Smooth or almost so, loosely bushy-branched, with mostly linear entire or slightly serrate rough-edged leaves, and loosely racemed flowering branchlets bearing solitary or few heads; scales of the involucre linear-spatulate and blunt, closely imbricated in several rows; rays usually light purple-blue, sometimes nearly white.

§ 4. *With small and very rigid linear sessile leaves, a large head solitary at the end of the simple stem or few branches, the involucre of narrow rigid scales closely imbricated in very many rows, without green tips, and showy violet-blue rays.*

A. linariifòlius, of the older botanists, strictly Diplopáppus linariifòlius (having a double pappus, the outer of very short bristles); common in open gravelly or sandy ground, 6′ – 20′ high; the spreading leaves with rough margins, strong midrib, and no veins.

37. ERÍGERON, FLEABANE. (Name of Greek words, for *spring* and *old man*, suggested probably by the hoary appearance of some vernal species.) ERIGERON SPECIÒSUM of Oregon is occasionally cultivated as a garden perennial, is more showy than any of the following, which are the common wild species of the country.

§ 1. *Rays conspicuous: heads more or less corymbed: stem erect.*

* *Rays purple or purplish, very numerous* (50 – 150): *pappus simple.* ♃

E. Philadélphicum, COMMON F. Low grounds: 2° high, rather hairy, with oblong mostly entire and partly clasping stem-leaves, spatulate and toothed root-leaves, and several heads; the rays very many and narrow, pale reddish-purple: fl. summer.

E. bellidifòlium, DAISY-LEAVED F. or ROBIN'S PLANTAIN. Moist ground, soft-hairy, 1° – 2° high, with a cluster of rather large roundish root-leaves lying flat on the ground, the stem-leaves rather few and small; heads 1 – 9 and long peduncled, rather large, with about 50 linear light bluish-purple rays: fl. late spring.

* * *Rays white, only about* 30, *rather broad: pappus simple.* ♃

E. vérnum. Low grounds from Virginia S.; smooth, with oval or spatulate leaves all at the root, slender scape 1° – 2° high, with a few small heads: fl. spring.

* * * *Rays white or nearly so,* 50 *or more, narrow: pappus double, the outer of a row of minute chaffy bristles or little scales.* ① ②

E. strigòsum, SMALLER DAISY-FLEABANE. Fields: 2° – 4° high, smoothish, or roughish with minute close-pressed hairs; leaves entire, the lower spatulate and slender-petioled, the upper lanceolate; rays pretty long: fl. all summer.

E. ánnuum, LARGER DAISY-FLEABANE. Fields and waste places; a common weed, 3° – 5° high, branched above, roughish with spreading hairs; leaves ovate or lance-ovate, the lower ones coarsely toothed; rays rather short, often tinged with purple: fl. all summer.

§ 2. *Rays inconspicuous, scarcely longer than the cylindrical bell-shaped involucre and the simple pappus, numerous, in more than one row.*

E. Canadénse, HORSEWEED or BUTTERWEED. A common weed in waste or cult. ground, bristly hairy; with erect strict stem 1° – 5° high, linear leaves, only the lowest ones cut-lobed, and very small panicled heads of whitish flowers, all summer. ①

38. BOLTÒNIA. (Named for *J. Bolton*, an English botanist.) Wild plants of low grounds S. & W., resembling Asters except in the akenes and pappus: ray-flowers blue-purple or nearly white; disk-flowers yellow; in autumn. ♃

B. diffùsa, of Illinois & S., has small heads loosely panicled on the slender open branches, which bear small awl-shaped leaves, those of the stem lance-linear; pappus of several bristles and 2 short awns.

B. glastifòlia, from Penn. S. & W., has fewer larger and corymbed heads, lanceolate partly erect leaves, broadly winged akenes, and 2 or 3 short awns in the pappus.

B. asteroìdes, from Penn. S., less common, is very like the last, but with narrow margins to the akenes and no awns (only a few short bristles) in the pappus.

39. BRACHÝCOME. (Name in Greek means *short tuft*, from the pappus, in which respect mainly it differs from the Daisy-genus.)

B. iberidifòlia, cult. for ornament, from Australia, has slender branching stems nearly 1° high, pinnately parted leaves with very slender divisions, and handsome heads with violet-blue ray-flowers and similar or darker purple centre, produced all summer. ①

40. BÉLLIS, DAISY. (The old Latin name of the Daisy, from *bellus*, pretty.) (Fl. spring and summer.)

B. integrifòlia, WESTERN WILD DAISY: in open grounds from Kentucky S. W., has branching spreading stems 4′ – 10′ long, bearing some lanceolate-oblong or spatulate leaves, and terminal slender-peduncled heads with pale blue-purple rays. ① ②

B. perénnis, TRUE or ENGLISH DAISY, cult. from Eu., mostly in double-flowered varieties, i. e. with many or all the disk-flowers changed into rays, or, in the common *quilled* form, all into tubes (pink or white): in the natural state the centre is yellow, the rays white and more or less purplish or crimson-tipped underneath; head solitary on a short scape; leaves spatulate or obovate, all clustered at the root. 2

41. ACHILLÈA, YARROW, SNEEZEWORT. (Named after *Achilles*.) Leafy-stemmed, with small heads in corymbs. 2

A. Millefòlium, COMMON Y. or MILFOIL, abounds over fields and hills, 10′ – 20′ high, with leaves twice pinnately parted into very slender and crowded linear 3 – 5-cleft divisions, heads crowded in a close flat corymb, with 4 or 5 short rays, white, sometimes rose-colored: all summer.

A. Ptármica, SNEEZEWORT. Run wild from Eu. in a few places, cult. in gardens, especially a full-double variety, which is pretty, fl. in autumn; leaves simple, lance-linear, sharply cut-serrate; heads in a loose corymb, with 8 – 12 or more rather long bright white rays.

42. MARÙTA, MAYWEED. (Meaning of the name uncertain.) Native of the Old World.

M. Cótula, or ANTHEMIS COTULA, the COMMON MAYWEED, along roadsides, especially E.; low, strong-scented and acrid, with leaves thrice pinnately divided into slender leaflets or lobes, rather small heads terminating the branches, with white rays and yellow centre; all late summer. ①

43. ÁNTHEMIS, CHAMOMILE. (Ancient Greek name, from the profusion of flowers.) Natives of Old World: fl. summer. Peduncles bearing solitary or very few heads.

A. arvénsis, FIELD C. Resembles Mayweed and grows in similar places, but rare, is not unpleasantly scented, has fertile rays and a minute border of pappus. ① ②

A. nóbilis, GARDEN C., yields the Chamomile-flowers of the apothecaries, spreads over the ground, very finely divided foliage pleasantly strong-scented; rays white; pappus none. 2

A. tinctòria, YELLOW C., is cult. for ornament, but hardly common: 2° – 3° high, with pinnately divided and again pinnatifid or cut-toothed leaves, and heads as large as those of Whiteweed, with golden-yellow flowers, or the rays sometimes white. 2

44. CHRYSÁNTHEMUM, including LEUCÁNTHEMUM and PYRÈTHRUM. (Name means *golden flowers* in Greek; but they are of various colors.) All natives of Old World.

§ 1. LEUCÁNTHEMUM or WHITEWEED and FEVERFEW: *the ray-flowers white, those of the centre mostly yellow.* 2

C. Leucánthemum, or LEUCÁNTHEMUM VULGÀRE, the too common WHITEWEED or OX-EYE DAISY, filling meadows and pastures, and difficult to eradicate; has stems nearly simple and erect from the creeping base or root-stock, bearing cut-toothed or slightly pinnatifid leaves below (the lowest spatulate, upper partly clasping), the naked summit bearing the single showy head, in early summer. 2

C. (or L.) Parthènium, or PYRÈTHRUM PARTHENIUM, FEVERFEW. Cult. in old gardens, and running wild; with branching leafy stems 1° – 3°

high, leaves twice pinnately divided into rather coarse ovate leaflets, and loose corymbs of rather small heads, in summer. A double-flowered variety has the disk-corollas transformed into white or whitish tubes.

C. parthenioides, DOUBLE-FL. or PARSELY-LEAVED FEVERFEW, from China; probably a low, finer-leaved, and much altered full double variety of the foregoing, with pure white flowers all in the form of rays, produced through the summer and autumn.

§ 2. CHRYSANTHEMUMS *of the gardens; the flowers of various colors, but only in certain varieties white.*

C. ròseum, from Persia and N. Asia, with simple stems bearing once or twice pinnately divided smooth leaves with linear divisions, and at the naked summit single heads as large as those of Whiteweed, but with pale rose or bright pink-red rays (and in some varieties full double), is coming into ornamental cultivation: the pulverized flower-heads form the well-known Persian Insect powder: fl. summer. 2/

C. Índicum, parent of the CHINESE CHRYSANTHEMUMS, flowering in late autumn, of numerous forms and colors, mostly full-double, &c. from China and Japan. 2/

C. coronàrium, SUMMER CHRYSANTHEMUM, with yellow or sometimes whitish flowers, cult. from N. Africa; smooth, with branching stems, twice pinnately parted leaves with auricled and clasping base, and lanceolate or linear cut-toothed divisions; the involucre of broad and scarious scales. ①

45. HELÈNIUM, SNEEZEWEED. (The old Greek name of some very different plant named after *Helen.*) North American herbs.

H. autumnàle, the commonest species, wild in low grounds, 1°–4° high, with lanceolate toothed leaves, their base often decurrent on the stem, and a corymb of showy yellow-flowered heads, the rays often drooping, in autumn. 2/

46. GAILLÁRDIA. (Named for *Gaillard,* a French amateur of botany.) North American low or spreading herbs: fl. all summer.

G. lanceolàta, wild from Carolina S. in pine barrens, has narrow mostly entire lanceolate leaves, commonly small and few yellow rays, and purple disk-flowers. ② 2/

G. pulchélla, wild from Louisiana W. and cult. for ornament (one form called G. PICTA), has broader leaves, some of them cut-toothed or lobed, and showy heads with the large rays mostly brownish crimson-purple with yellow tips. ①

G. aristàta, wild from Missouri W., and cult., is more downy than the last, less branched, with large showy rays yellow throughout, or their base brown-purple. 2/

47. GAZÁNIA. (Named for a learned ecclesiastic of the middle ages, *Theodore de Gaza.*) South African plants of the conservatory, and flowering all summer when bedded out.

G. rìgens, also named SPLÉNDENS, of Cape of Good Hope, with short stems spreading on the ground, bearing spatulate entire or some pinnatifid leaves, which are nearly smooth and green above, but very silvery with white cotton underneath, and a large showy head, the orange rays over 1′ long, and with a dark eye-spot at base. 2/

48. CALÉNDULA, MARIGOLD. (Name from the Latin *calendæ* or *calends;* flowering through the months.)

C. officinàlis, GARDEN MARIGOLD, of the Old World; cult. in country gardens, 1° high, spreading, with green and succulent oblong and entire sessile leaves, rather unpleasantly scented, and large head of yellow flowers, produced all summer, sometimes nearly full-double, most of the corollas being strap-shaped. ①

49. POLÝMNIA, LEAF-CUP. (These coarse and inelegant plants are oddly dedicated to one of the Muses.) Fl. summer and autumn. 2

P. Canadénsis, common in shaded ravines N., is 3° – 5° high, clammy-hairy, with thin leaves, the lower pinnatifid, the upper 3 – 5-lobed or angled, and the few pale-yellow and broad rays of the small heads shorter than the involucre.

P. Uvedàlia, in rich soil from New York to Ill. and S., is roughish-hairy, stout, 4° – 10° high, with large ovate and angled or lobed leaves, the upper ones sessile, and rays of the pretty large head 10 – 15, bright yellow, longer than the involucre.

50. SÍLPHIUM, ROSIN-PLANT. (Ancient Greek name of some very different plant.) Fl. summer and autumn. 2

§ 1. *Leaves alternate, large, most of them petioled.*

* *The stout and rough flowering stems* (3° – 6° *high*) *leafy up to the few large heads: scales of involucre ovate, with tapering and spreading rigid tips.*

S. laciniàtum, ROSIN-WEED or COMPASS-PLANT, of prairies, from Michigan W. & S., so called because the rough-hairy deeply pinnatifid root-leaves (of ovate outline) incline to present their edges N. & S.

* * *The slender smooth flowering stems* (4° – 10° *high*) *leafy only near the base, dividing above into a panicle of many smaller heads.*

S. terebinthinàceum, PRAIRIE-DOCK, so called from the appearance of the large root-leaves, which are ovate or heart-oblong and 1° – 2° long, besides the slender petiole, the margins somewhat toothed: common W.

S. compósitum, from North Carolina S., is more slender and smaller, with round heart-shaped leaves either toothed or cut, or divided.

§ 2. *Leaves or many of them in whorls of* 3 *or* 4 *along the terete stems, rather small, entire or coarsely toothed.*

S. trifoliàtum, of S. & W., has the smooth stem 4° – 6° high, lanceolate roughish leaves, and small heads.

S. Asteríscus, of dry soil S., is rough-hairy, with fewer and larger heads.

§ 3. *Leaves opposite and clasping or connate: stems leafy to the top.*

S. integrifòlium, in prairies from Michigan W. & S.; roughish, 2° – 4° high, with lance-ovate partly heart-shaped and entire distinct leaves.

S. perfoliàtum, CUP-PLANT, of rich soil W. & S.: with very smooth square stems 4° – 9° high, around which the ovate coarsely toothed leaves are connate into cup which holds water from the rains.

51. DÁHLIA. (Named for a Swedish professor, *Dahl*, contemporary with Linnæus.) 2 Two or three Mexican species, of which the most familiar is

D. variábilis, COMMON DAHLIA of the gardens, with pinnate leaves, ovate serrate leaflets, and large heads, much increased in size and altered, of all colors: roots fascicled and tuberous (Lessons, p. 35, fig. 87).

52. COREÓPSIS, TICKSEED. (Named from Greek word for *bug*, from the shape of the akenes.) Many wild species: several cult. for ornament: these are the commonest. Fl. summer. (See Lessons, p. 94, fig. 268, 269.)

§ 1. *Rays broad, coarsely* 3 – 5*-toothed: outer involucre not longer than the inner: akenes orbicular or oval, incurved when mature. Chiefly cultivated.*

* ① ② *Disk-flowers and lower part of the rays dark-colored or brown-purple: akenes in these species wingless and nearly naked at top: leaves compound.*

C. tinctòria, of Arkansas, &c., the commonest COREOPSIS or CALLIOPSIS of all country gardens; smooth, with lower leaves twice-pinnately divided into narrow leaflets, numerous heads, and lower half or sometimes almost the whole of rays brown-purple: in one variety they are changed to tubes.

C. Drummóndii, of Texas, is low and spreading, rather hairy, with leaves of 3 – 7 oval leaflets, or some of them simple, heads on long peduncles, and very broad rays golden yellow with small dark spot at base.

* * ① *Disk-flowers yellow: rays yellow with a darker and purplish-streaked spot near the base: akenes winged and 2-toothed.*

C. coronàta, of Texas, is low, with slender-petioled leaves oblong or spatulate, or some of them 3 – 5-parted, and very long peduncle; rays broad and handsome.

* * * ♃ *Disk-flowers and rays* (1′ *long*) *entirely yellow; akenes orbicular, much incurved and broadly winged when ripe, crowned with* 2 *little teeth or scales.*

C. lanceolàta. Wild W. & S., and cult. in gardens; 1° – 2° high, smooth or sometimes downy, in tufts, with lanceolate or oblanceolate entire leaves mostly crowded at the base, and long slender peduncles: flowers in early summer.

C. auriculàta. Wild W. & S., and in some gardens; taller, sometimes with runners or suckers at base, leafy to near the top; upper leaves oblong, lower roundish and sometimes auricled at base or with 3 – 5 lobes or leaflets.

§ 2. *Rays entire or nearly so, oblong or lanceolate: akenes oblong, with a very narrow wing or border, not incurved, and obscurely if at all* 2*-toothed at the apex: scales of outer involucre narrow and entire: heads rather small, the flowers all yellow.* ♃

* *Low,* 1° – 3° *high, leafy to the top: leaves really opposite and sessile, but divided into* 3 *leaflets, thus seeming to be* 6 *in a whorl. Wild chiefly in S. States, all but the first are cult. in gardens.*

C. senifòlia, has seemingly 6 lance-ovate and entire leaflets in a whorl, (i. e. two, but each 3-divided) smooth or downy.

C. verticillàta, has the pair cut into once or twice pinnate almost thread-shaped divisions, smooth.

C. delphinifòlia, very like the last, but with fewer lance-linear divisions.

* * *Tall, leafy to the top, with evidently opposite petioled leaves.*

C. trípteris. Rich ground W. & S., with simple stems 4° – 9° high, leaves of 3 – 5 lanceolate entire leaflets, corymbed heads, very short outer involucre, and blunt rays.

§ 3. *Rays oval or oblong, golden yellow, slightly notched: akenes wingless, not incurved, bearing* 2 *awns or teeth for a pappus: outer involucre conspicuous and resembling leaves: branching plants of wet grounds, with thin leaves mostly of* 3 – 7 *pinnate toothed or cut veiny leaflets; resembling the next genus, but the awns not downwardly barbed.* ① ②

C. trichospérma. Swamps mostly near the coast, 1° – 2° high, with 3 – 7 lanceolate or linear cut-toothed leaflets or divisions, numerous heads, and narrow-oblong or linear wedge-shaped marginless akenes with 2 stout teeth.

C. aùrea, only S., has upper leaves often simple, lower nearly as in the foregoing, and shorter wedge-obovate akenes with 2 or 4 short chaff-like teeth.

C. aristòsa, from Illinois S., has more compound leaves with oblong or lanceolate often pinnatifid leaflets, and broad-obovate very flat akenes slightly margined and bristly ciliate, the pappus of 2 long and slender awns, or sometimes 3 or 4, or in one variety none at all.

53. BÌDENS, BUR-MARIGOLD, BEGGAR-TICKS. (Latin for two-toothed, from the usually 2 awns of the pappus.) Our species ① or ②; fl. summer and autumn. The akenes adhering to the dress or to the fleece of animals by their barbed awns.

§ 1. *Akenes broad and flat, with bristly ciliate margins.*

* *Coarse and very homely weeds, commonly without any rays.*

B. frondòsa, Common Beggar-ticks. Coarse weed in low or manured grounds, 2° – 6° high, branched, with pinnate leaves of 3 – 5 broad lanceolate

coarsely toothed leaflets, outer involucre much longer than the head, and wedge-obovate akenes ciliate with upturned bristles, and 2-awned.

B. connàta, Swamp B. Low grounds; smooth, 1° – 2° high, with simple lanceolate and taper-pointed leaves, or the lower 3-divided and decurrent on the petiole, smaller heads, narrow wedge-shaped akenes minutely and downwardly ciliate and bearing about 3 awns.

* * *Low smooth herbs, with showy golden yellow rays* 1′ *long.*

B. chrysanthemoìdes, Larger Bur-Marigold. Shallow water or wet places, 6′ – 30′ high, with simple lanceolate sessile serrate leaves, outer involucre shorter than the rays, and wedge-shaped akenes with almost prickly downwardly barbed margins and 2 – 4 awns.

§ 2. *Akenes linear or needle-shaped.*

B. Béckii, Water B. Immersed in water, N. and W., the single short-peduncled heads rising above the surface, and with showy rays; leaves cut into very numerous fine hair-like divisions; awns of the stout akenes 4 – 6, barbed near the tip.

B. bipinnàta. Dry soil, from Conn. to Ill. and S., 1° – 3° high, branched, with 1 – 3-pinnately parted petioled leaves, ovate-lanceolate leaflets, small heads, short pale-yellow rays, and slender akenes with 3 – 4 barbed awns.

54. ACTINÓMERIS. (Greek-made name, alluding to the irregularity of the rays in the commonest species.) ♃

A. squarròsa, common in low rich soil from W. New York S. & W.; with branching stems 4° – 8° high, lance-oblong leaves tapering to both ends, numerous rather corymbed heads, spreading involucre, 4 – 10 irregular rays, and broadly winged akenes: fl. Sept.

A. helianthoìdes, in open grounds W. & S., resembles a Sunflower as the name denotes, 1° – 3° high, with more hairy lance-ovate sessile leaves, few and larger heads, erect involucre, 8 – 15 regular rays, and slightly winged akenes: fl. summer.

55. VERBESÌNA, CROWNBEARD. (Origin of name obscure.) Ours are tall (4° – 7° high) branching herbs in rich soil, with compound corymbs of small heads: fl. summer. ♃

V. Siegesbéckia, from S. Penn. to Ill. & S., has 4-winged stems, smoothish, large and thin ovate and opposite leaves pointed at both ends, yellow flowers, and wingless akenes.

V. Virgínica, of same range, has stem, less winged, smaller lance-ovate alternate leaves soft-downy beneath, white flowers, and narrowly winged akenes.

56. XIMINÈSIA. (Named for *J. Ximines*, a Spanish apothecary.)

X. encelioìdes, of Texas and Mexico, and cult. for ornament, 2° high, spreading, rather hoary, at least the lower face of the oblong or heart-shaped clasping serrate leaves; the bright yellow heads somewhat corymbed, showy, the rays deeply 3-toothed: fl. all summer. ①

57. HELIÁNTHUS, SUNFLOWER (which the name means in Greek). The following are the commonest of the numerous species, many of which are difficult.

§ 1. ① *Receptacle flat and very broad: disk brownish: leaves alternate, broad and triple-ribbed, petioled: fl. summer. Cult. for ornament: wild only far S. W.: fl. all summer.*

H. ánnuus, the Great Common Sunflower of the gardens, with huge heads; leaves green, roughish, not hoary.

H. argophýllus, of Texas, cult. for its hoary-white foliage; heads smaller.

§ 2. ♃ *Receptacle and disk convex: heads middle-sized or rather small: flowering throughout late summer and autumn.*

* *Disk dark purple, contrasting with the yellow rays.*

+– *Leaves long and linear, 1-nerved, entire, sessile: heads small and mostly corymbed: involucre of leaf-like spreading scales.*

H. angustifòlius, of pine-barrens from New Jersey S., has slender rough stems 2° – 6° high, lower leaves opposite and rough.

H. orgyàlis, of Kansas and Arkansas, cult., has stems (6° – 10° high), and crowded very narrow alternate leaves smooth: fl. late.

+– +– *Leaves oval or lanceolate, opposite: stems 1° – 3° high, bearing solitary or few long-peduncled rather large heads: involucre of short close scales.*

H. heterophýllus, of low pine-barrens S.; rather hairy, with lowest leaves oval or oblong, upper ones lance-linear and few; scales of involucre lanceolate.

H. rígidus, of dry prairies W. & S.; rough, with thick firm leaves lance-oblong or the lower oval; scales of the involucre ovate or oblong, blunt.

* * *Disk yellow as well as the rays, or hardly dingy-brownish.*

+– *Scales of the involucre short and broadly lanceolate, regularly imbricated, without leaf-like tips: leaves nearly all opposite and nearly entire.*

H. occidentàlis, of dry barrens from Ohio W. & S.: somewhat hairy, with slender simple stems 1° – 3° high, sending off runners from base, naked above, bearing 1 – 5 heads; lowest leaves ovate or lance-ovate; upper ones narrow, small and distant.

H. móllis, of same situations, is soft white-woolly all over, 2° – 4° high, leafy to the top, the leaves heart-ovate and partly clasping.

+– +– *Scales of the involucre looser and leafy-tipped: stems leafy to the top.*

++ *Leaves chiefly alternate and not triple-ribbed.*

H. gigantèus, common in low grounds N.; rough and rather hairy, 3° – 10° high, with lanceolate serrate nearly sessile leaves, and pale yellow rays.

++ ++ *Leaves mainly opposite, except in the last, 3-ribbed at base or triple-ribbed.*

H. divaricàtus, common in dry sterile soil, has smooth stem 1° – 3° high, rough ovate-lanceolate leaves tapering to a point and 3-nerved at the rounded sessile base.

H. hirsùtus, only W., differs from the preceding in its rough-hairy stem 1° – 2° high, and leaves with narrower base more or less petioled.

H. strumòsus, common in low grounds, has mostly smooth stems 3° – 4° high, broadly lanceolate or lance-ovate leaves rough above and whitish or white-downy beneath, their margins beset with fine appressed teeth, and petioles short and margined.

H. decapétalus, so named because (like the preceding) it commonly has 10 rays; common along streams, has branching stems 3° – 6° high, thin and bright-green smoothish ovate leaves coarsely toothed and abruptly contracted into margined petioles; scales of the involucre long and loose.

H. tuberòsus, Jerusalem Artichoke (i. e. *Girasole* or Sunflower in Italian, corrupted in England into *Jerusalem*): cult. for the tubers and run wild in fence-rows, probably a state of a wild S. W. species; 5° – 7° high, with triple-ribbed ovate petioled leaves, rough-hairy as well as the stems, all the upper ones alternate, the running rootstocks ending in ovate or oblong edible tubers.

58. HELIÓPSIS, OX-EYE. (Greek-made name, from the likeness to Sunflower.)

H. lævis, our only species, common in rich or low grounds, resembles a Sunflower of the last section, but has pistillate rays and 4-sided akenes without pappus: 1° – 4° high, smooth; leaves ovate or lance-ovate, triple-ribbed, petioled, serrate; head of golden-yellow flowers terminating the branches, in summer. 2

59. RUDBÉCKIA, CONE-FLOWER. (Named for *Rudbeck*, father and son, Swedish botanists.) The following are the commonest species, all natives of this country: fl. summer.

§ 1. *Disk broadly conical, dark-colored, the soft chaff not pointed: rough-hairy plants 1° – 2° high, leafy below, the naked summit of the stems or branches bearing single showy heads: leaves simple.* 4

R. speciòsa, from Penn. W. & S., and cult. in some gardens; leaves lanceolate or ovate-lanceolate, pointed at both ends, 3 – 5-nerved, petioled, coarsely toothed or cut.

R. hírta, common in open ground W. & S., introduced into meadows E. with clover-seed; stems stout and mostly simple; leaves nearly entire, triple-ribbed, oblong-lanceolate or the lowest spatulate, the upper sessile.

§ 2. *Disk conical, dark-purple, the chaff awn-pointed: lower leaves often pinnately parted or 3-cleft.* ②

R. tríloba, from Penn. to Ill. & S.; hairy, 2° – 5° high, much branched, with upper leaves lance-ovate and toothed, and the numerous small heads with only about 8 rays.

§ 3. *Disk globular, pale dull brownish (receptacle sweet-scented), the chaff blunt and downy at the end; lower leaves 3-parted.* 4

R. subtomentòsa, of the prairies and plains W.; somewhat downy, with leafy stems 3° – 5° high, ovate or lance-ovate serrate upper leaves and short-peduncled heads.

§ 4. *Disk oblong, or in fruit cylindrical and 1′ long, greenish yellow, the chaff very blunt and downy at the end: leaves all compound or cleft.* 4

R. laciniàta, COMMON CONE-FLOWER, in low thickets; 3° – 7° high, smooth, branching above; lowest leaves pinnate with 5 – 7 cut or cleft leaflets, upper ones 3 – 5-parted, or the uppermost undivided; heads long-peduncled, with linear drooping rays 1′ – 2′ long.

60. LÉPACHYS. (Supposed to be formed from Greek words for *thick* and *scale*.) Receptacle anise-scented when crushed. Fl. summer.

L. pinnàta, in dry soil from W. New York W. & S.: minutely roughish and slightly hoary; the slender leafy stems 3° – 5° high, bearing leaves of 3 – 7 lanceolate leaflets, and somewhat corymbed heads with the oval or oblong disk much shorter than the oblong drooping yellow rays; akenes scarcely 2-toothed, flattish, the inner edge hardly wing-margined. 4

L. columnàris, of the plains W. of the Mississippi; cult. for ornament; 1° – 2° high, with single or few long-peduncled heads, their cylindrical disk often becoming 2′ long, and longer than the 5 – 8 broad drooping rays, these either yellow, or var. PULCHÉRRIMA, with the base or lower half brown-purple; akenes 1 – 2-toothed at top and winged down one edge. 4

61. DRACÒPIS. (Name refers in some obscure way to a *Dragon*.) ①

D. amplexicaùlis, wild far S. W., sometimes cult. for ornament; smooth, 1° – 2° high, with clasping heart-shaped pale leaves, and long-peduncled heads, like those of the preceding, the broad rays mostly shorter than the cylindrical disk, and either yellow or the lower part brown-purple.

62. ECHINÀCEA, HEDGEHOG CONE-FLOWER. (Name means like a *hedgehog*, viz. receptacle with prickly pointed chaff.) Fl. summer. 4

E. purpùrea, in prairies and open grounds from W. Penn. W. & S.: stems 1° – 2° high from a thick and black pungent-tasted root (called *Black Sampson* by quack-doctors), bearing ovate or lanceolate 5-nerved and veiny leaves, the lower long-petioled, and terminated by a large head; rays 15 – 20, dull rose-purple.

E. angustifòlia, from Wisconsin S., is a more slender form, with narrow lanceolate 3-nerved entire leaves, and 12 – 15 brighter-colored rays.

63. ZÍNNIA. (Named for a German professor, *Zinn.*) Commonly cultivated for ornament: fl. all summer.

Z. élegans, the favorite GARDEN ZINNIA, from Mexico, with ovate heart-shaped half-clasping leaves, and very large heads of rose-colored, purple, violet, red, or white flowers, 2 – 3′ in diameter, of late also full-double like a small Dahlia; chaff of receptacle crested-toothed at tip; akenes barely 2-toothed at summit. ①

Z. multiflòra, from Mexico, &c., now not common in gardens, being less showy, has ovate-lanceolate leaves, hollow peduncle much enlarged under the head, obovate red-purple rays, blunt entire chaff, and 1-awned akenes. ①

Z. angustifòlia, cult. as Z. AÙREA, from Mexico, is widely and copiously branched, rough-hairy, with lanceolate leaves, many small heads, oval orange-yellow rays, and conspicuously pointed chaff.

64. TAGÈTES, FRENCH or AFRICAN MARIGOLD, but from South America and Mexico. (Mythological name.) Fl. all summer. ①

* *Plant anise-scented, with entire leaves, small corymbed heads, and few rays.*

T. lùcida, now rather uncommon in gardens, has glossy lanceolate serrate leaves, and orange flowers.

* * *Plant strong-scented: leaves pinnate: leaflets cut-toothed: head large.*

T. erécta, LARGE AFRICAN M., with lanceolate leaflets, inflated club-shaped peduncles, and heads of orange or lemon-colored flowers, often full double.

T. pátula, FRENCH M., with finer lance-linear leaflets, cylindrical peduncles, and narrower heads, the rays orange or with darker stripes.

T. signàta is a more delicate low much-branched species, with finely cut leaves, slender peduncles, and smaller heads, the 5 rays purple-spotted or spotted and striped with darker orange at base.

65. DYSÒDIA, FETID MARIGOLD. (Name, in Greek, denotes the ill-scent of the plant.) Fl. late summer and autumn.

D. chrysanthemoìdes. Roadsides and river-banks W. & S. W.: a low weed, nearly smooth, with spreading branches, opposite pinnately parted and finely cut leaves, and few yellow rays scarcely exceeding the involucre. ①

66. CICHÒRIUM, SUCCORY, CICHORY, or CHICORY. (Arabic name of the plant.) Fl. all summer.

C. Íntybus, COMMON C. Nat. from Eu. by roadsides, &c. mainly E. leaves runcinate, rough-hairy on the midrib, or the upper ones on flowering stems small and bract-like, entire; showy blue flowers opening only in the morning and in cloudy weather; deep root used as substitute for coffee. ♃

C. Endívia, ENDIVE, cult. from East Indies, for autumn salad; leaves smooth, slightly or deeply toothed, or much cut and crisped, flowering stems short and leafy. ② ①

67. TRAGOPÒGON, SALSIFY. (Greek name for *goat's-beard,* from the pappus.) Fl. early summer.

T. porrifòlius, COMMON S. or OYSTER-PLANT. Cult. from Eu. for the edible tap-root, sometimes running wild: smooth and pale, 2° – 4° high, branching, with long leaves tapering from a clasping base to a slender apex, very large heads on hollow peduncle much thickened upwards, and deep violet-purple flowers. ②

68. LEÓNTODON, HAWKBIT. (Greek name for *lion-tooth,* from the runcinate leaves of some species.)

L. autumnàle, FALL DANDELION or HAWKBIT. Nat. from Europe in meadows and lawns E.: leaves pinnatifid or laciniate; scapes slender, 8′ – 12′ high, branching; peduncles thickish and scaly-bracted next the small head fl. summer and autumn. ♃

69. HIERÀCIUM, HAWKWEED (which the name means in Greek). Wild plants of the country, in dry ground: fl. summer and autumn. 2

H. Canadénse, chiefly N., has simple stems 1°–3° high and leafy up to the corymbed summit; lanceolate or oblong acute leaves with a few coarse teeth, and rather large heads with loose imbricated involucre.

H. paniculàtum, in woods, has slender and branching leafy stems 2°–3° high, lanceolate scarcely toothed leaves, a loose panicle of very small 12–20-flowered heads on slender peduncles, the involucre very simple.

H. scàbrum, in more open grounds, is roughish-hairy, with rather stout simple stem (2°–3° high), bearing obovate or oval nearly entire leaves, and a narrow panicle of many small heads, the 40–50-flowered involucre and stiff peduncles thickly beset with dark glandular bristles; akenes not tapering.

H. longípilum, in prairies W., is so named from the exceedingly long (often 1′) straight bristly hairs of the stem; has narrow oblong entire leaves, panicle and 20–30-flowered involucre between the last and the next, and akenes spindle-shaped.

H. Gronòvii, common in sterile soil, with slender stems leafy and very hairy below, leaves oblong or obovate, panicle narrow, small heads, slender peduncles and 20–30-flowered involucre sparingly glandular-bristly, and spindle-shaped akenes with very tapering summit.

H. venòsum, RATTLESNAKE-WEED; common in dry sandy ground, very smooth or with a few hairs; with leaves chiefly at the root, obovate or oblong, thin, purple-tinged beneath and purple-veiny above; scape slender, 1°–2° high, forking into 2–7 slender peduncles bearing small about 20-flowered heads; akenes linear, not tapering.

70. NÁBALUS, RATTLESNAKE-ROOT. (Name from Greek word for a *harp,* alluding probably to the lyrate leaves of some species.) Roots tuberous or spindle-shaped, bitter. Fl. late summer and autumn. 2

* *Peduncles and* 5–12*-flowered heads smooth: leaves very variable.*

N. altíssimus, TALL R. or WHITE-LETTUCE. Rich woods N., 3°–6° high, with long and narrow leafy panicle, petioled leaves inclined to be ovate-triangular; heads 5–6-flowered; pappus dirty white.

N. álbus, COMMON WHITE-LETTUCE, in open woods, chiefly N. and W., is glaucous, with more corymbed panicles of 8–12-flowered heads, usually more cut or divided leaves, and cinnamon-colored pappus.

N. Fràseri, LION'S-FOOT, or GALL-OF-THE-EARTH, is commonest in dry soil E. and S., 1°–4° high, with narrow-corymbed panicles of 8–12-flowered heads, and pappus dull straw-color.

* * *Peduncles and* 12–40*-flowered heads hairy. Chiefly West, on plains, &c.*

N. racemòsus has smooth wand-like stem 2°–5° high, lance-oblong slightly toothed leaves, the upper ones partly clasping, and a narrow spiked panicle of about 12-flowered heads.

N. ásper is similar, but rough-pubescent, the 12–14-flowered heads mostly erect and larger.

N. crepedínius, only W., is smoother, with stout stem 5°–8° high, wide corymbed panicles of 20–40-flowered heads, brown pappus, and broad leaves 6′–12′ long on winged petioles.

71. PYRRHOPÁPPUS, FALSE DANDELION. (Name means in Greek *flame-colored pappus;* this and the leafy stems obviously distinguish this genus from the next.) ① ②

P. Carolinìanus, in sandy fields from Maryland S.: 1°–2° high, with oblong or lanceolate leaves often pinnatifid or cut, the upper partly clasping: fl. spring and summer.

72. TARÁXACUM, DANDELION. (Greek name referring to medicinal properties of the root.) ② 2

T. Dens-leònis, COMMON D., in all fields, &c., from spring to autumn. Inner involucre closes after blossoming till the akenes mature and the beak

lengthens and elevates the pappus; then the involucre is reflexed, the pappus spreads, and with the fruit is blown away by the wind.

73. LACTÙCA, LETTUCE. (Ancient Latin name, from the milky juice.)

L. sativa, GARDEN LETTUCE. Cultivated from Europe, the broad and tender root-leaves used for salad; stem-leaves heart-shaped and clasping; flowers yellow. ① ②

L. Canadénsis, WILD LETTUCE. Open grounds, 3° – 9° high, with lanceolate or oblong leaves often pinnatifid, sometimes entire; flowers pale yellow, sometimes purple or reddish. ②

74. MULGÈDIUM, FALSE or BLUE LETTUCE. (Name from Latin *mulgeo,* to milk.) Fl. summer, in thicket-borders, &c.

M. acuminàtum, from New York to Ill. & S.; 3° – 6° high, with ovate or lance-ovate barely serrate leaves on winged petioles, blue flowers, and bright white pappus. ②

M. Floridànum, from Penn. W. & S.; like the first, but with all the leaves or the lower ones lyrate or runcinate, uppermost partly clasping. ②

M. leucophæum, in low grounds: resembles Wild Lettuce, and with equally variable lanceolate or oblong often irregularly pinnatifid leaves, very compound panicle of pale blue or bluish-white flowers, and tawny pappus. ②

75. SÓNCHUS, SOW-THISTLE. (Ancient Greek name.) Coarse weeds, with soft-spiny-toothed runcinate-pinnatifid leaves: nat. from Eu.: fl. summer.

S. oleràceus, COMMON S.; in manured soil and damp waste places; 1° – 5° high, acute auricles to the clasping base of the leaves, pale yellow flowers, and akenes wrinkled transversely. ①

S. ásper, like the last, but the leaves less divided and more spiny-toothed, the auricles of their clasping base rounded, and akenes smooth with 3 nerves on each side. ①

S. arvénsis, FIELD S. Less common E.; 1° – 2° high from creeping root-stocks, with larger heads of bright yellow flowers, and bristly peduncles and involucre. 2ℓ

62. LOBELIACEÆ, LOBELIA FAMILY.

Plants with milky acrid juice, alternate simple leaves, and scattered racemed or panicled flowers; the calyx-tube adherent to the many-seeded ovary and pod; the corolla irregularly 5-lobed and mostly split down as it were on the upper side; the 5 stamens united into a tube commonly by their filaments and always by their anthers; style only one.

Downíngia élegans, under the older name of CLINTÒNIA ÉLEGANS, and **D. pulchélla,** formerly CLINTÒNIA PULCHELLA, are delicate little annuals from California, sparingly cultivated. They resemble small Lobelias, with very bright blue flowers, but are known by the very long and slender 1-celled pod, and short tube of corolla not much split down. The first has the 2 narrow lobes approaching each other opposite the 3-lobed lip which has a whitish centre. The second has a larger corolla, with centre of the 3-lobed lip yellow and white, and the 2 other lobes widely diverging. — The other common plants of the order belong to

1. LOBÈLIA (named after the herbalist *De l'Obel* or *Lobel*). Tube of the calyx and 2-celled pod short. Corolla split down on one side, the 5 lobes more or less irregular or unequal. Two or all 5 anthers bearded at top.

* *Exotic, cultivated for ornament.*

L. Erinus, from Cape of Good Hope, the common low and spreading little Lobelia of conservatories and summer gardens, with abundant small flowers azure-blue, usually white in the throat, and narrow toothed upper leaves: ① or continued by cuttings.

L. laxiflòra, from Mexico, cultivated in conservatories under the name of SIPHOCÁMPYLUS BÍCOLOR; tall, with curved and large red and yellow flowers, hanging on long slender peduncles from the axils of the oblong or lanceolate toothed leaves. 2

* * *Wild species of the country, one or two of them sometimes cultivated for ornament; fl. summer: growing in wet or low grounds, except two of them.*

+ *Corolla deep red: stems tall and simple.*

L. cardinàlis, CARDINAL-FLOWER, with lance-oblong leaves and erect raceme of large and showy flowers, which are very rarely rose-colored or even white. ② 2

+ + *Flowers blue or with some white in the throat.*

L. inflàta, INDIAN TOBACCO. Somewhat hairy, 9′ – 18′ high, much branched, with ovate toothed leaves, and spike-like leafy racemes of small flowers, the pale blue corolla only 2″ long, and pod inflated. ① Common in fields: a noted quack medicine.

L. syphilítica, GREAT BLUE L. Slightly hairy, 1° – 3° high, leafy, with ovate-oblong irregularly toothed leaves, dense leafy raceme, hairy calyx, and corolla almost 1′ long. 2

L. pubérula, chiefly S. & W.; minutely soft-downy, with blunter and finer-toothed leaves, and rather 1-sided spike of smaller deeper-blue flowers. 2

L. spicàta, in sandy or gravelly damp or dry soil; smoothish, with long and wand-like stems 1° – 3° high, obovate lowest leaves, narrow and small upper ones, and close naked raceme of very small flowers. ② 2

L. Kálmii, of wet banks N.; smooth, with branching stems 5′ – 12′ high, obovate root-leaves, few and lanceolate or linear stem-leaves, a loose raceme of slender-pedicelled and small but handsome bright-blue flowers, and obovate pods. ② 2

63. CAMPANULACEÆ, CAMPANULA FAMILY.

Herbs with milky juice, alternate leaves, and scattered flowers, with regular 5-lobed (blue or white) corolla and 5 stamens borne on the summit of the calyx-tube which is adherent to the 2 – 5-celled many-seeded ovary and pod; style 1; stigmas as many as the cells of the ovary. Stamens separate in all our plants of the order, which by this and by the regular corolla (valvate in the bud) are distinguished from the preceding.

1. SPECULARIA. Corolla nearly wheel-shaped. Stigmas 3. Pod linear or narrow oblong, opening by a lateral valve or short cleft into each cell. Otherwise as in the next.
2. CAMPANULA. Corolla bell-shaped, or of various shapes. Stigmas and cells of the short pod 3 – 5, each cell of the latter opening by a lateral valve or short cleft.
3. PLATYCODON. Corolla very broadly open from a narrow base, balloon-shaped in the bud. Pod top-shaped, 5-celled, opening at the top into 3 – 5-valves.

1. SPECULÀRIA, VENUS'S LOOKING-GLASS. (Old Latin name of European species is *Speculum Veneris.*) Fl. all summer. ①

S. Spéculum, GARDEN V., cult. from Eu. for ornament, is a low herb, with oblong leaves, pretty blue flowers terminating the spreading branches, and linear triangular pod.

S. perfoliàta, a wild weedy plant in sterile or sandy ground, with simple stems 3′ – 20′ high, furnished throughout with round-heart-shaped clasping leaves, and small flowers in their axils, only the later ones expanding a small blue corolla; pod oblong.

2. CAMPÁNULA, BELLFLOWER or HAREBELL. (Diminutive of Italian or late Latin name for *bell.*) Fl. summer. (Lessons, p. 90, fig. 254.)

* *Wild species of the country, all with 3 stigmas and 3-celled pod.*

C. Americàna, Tall Wild B. Rich moist ground especially W., with stem 3° - 6° high, thin lance-ovate taper-pointed serrate leaves, and long loose spike of flowers, the almost wheel-shaped light-blue corolla 1′ broad, and long curved style. ① ②

C. aparinoides, Small Marsh B. Grassy wet places, with delicate weak stem 8′ – 20′ high, and rough backward on the angles, bearing small lance-linear leaves and a few small flowers on diverging peduncles, the bell-shaped corolla 3″ – 4″ long. ♃

C. rotundifòlia, Common Harebell. On precipices and rocky banks N., with tufted spreading slender stems 5′ – 12′ high, round or heart-shaped root-leaves, dying early, but narrow mostly linear stem-leaves (the specific name therefore unfortunate), and a few slender-peduncled flowers, the blue bell-shaped corolla 6″ – 8″ long. ♃

* * *European species of the gardens: flowers mostly blue, with white varieties.*

+ *Stigmas and cells of the pod* 3 : *no appendages to calyx.* ♃

C. Carpáthica. Smooth, tufted, 6′ – 10′ high, with roundish or ovate petioled small leaves, slender 1-flowered peduncles, and open bell-shaped corolla about 1′ long.

C. rapunculoides. Weedy, spreading inveterately by the root, rather hairy, the erect leafy stems 1° – 2° high, with lowest leaves heart-shaped and petioled, upper lance-ovate and sessile, nodding flowers in the axil of bracts forming a leafy raceme, and tubular-bell-shaped corolla 1′ long.

C. Trachèlium. Roughish-hairy, 2° – 3° high, with more coarsely toothed and broader leaves than the last, and rather larger bell-shaped corolla.

C. persicæfòlia. Smooth, with upright stems 1° – 2½° high, and bearing small lance-linear leaves, root-leaves broader, all beset with minute close teeth; the flowers nearly sessile and erect, rather few in a sort of raceme, the open bell-shaped corolla 1½′ – 2′ long, sometimes double.

+ + *Stigmas and cells of the pod* 5 : *calyx with reflexed leafy appendages.* ① ②

C. Mèdium, Canterbury Bells. Erect, branching, hairy, with coarse toothed leaves, and oblong-bell-shaped flowers 2′ – 3′ long, often double.

3. PLATYCÒDON. (A Greek-made name, means *broad bellflower.*) ♃

P. grandiflòrum. Cult. from Siberia; very smooth, pale or glaucous, rather low and spreading, with lance-ovate coarsely toothed leaves, terminal peduncle bearing a showy flower, the broadly expanded 5-lobed corolla fully 2′ broad, blue or white, sometimes double, in summer.

64. ERICACEÆ, HEATH FAMILY.

Very large family, chiefly of shrubs, difficult to define as a whole; the leaves are simple and mostly alternate; the flowers almost all regular, and with as many or twice as many stamens as there are petals or lobes of the corolla; their anthers 2-celled, each cell more commonly opening by a pore or hole at the end; ovary mostly with as many cells as there are lobes to the corolla; style only one, and seeds small.

Epacris is a genus and the type of a family or sub-order of Heath-like shrubs, of Australia, some of them cult. in conservatories

Epacrises and the like differ from Heaths in their stamens (often inserted on the tube of the corolla) having one-celled anthers. The Heath Family comprises the following subordinate families:—

I. WHORTLEBERRY FAMILY, known by having the tube of the calyx adherent to the ovary, on which the monopetalous corolla and the stamens are therefore mounted. All are shrubs, with scaly buds. Fruit a berry or berry-like.

1. GAYLUSSACIA. Stamens 10: anthers with the cells opening by a chink at the blunt or tapering top. Ovary 10-celled with one ovule in each cell, forming a berry-like fruit containing 10 apparent seeds, or properly little stones. Flowers in lateral racemes; branchlets and leaves beset with resinous or clammy dots or atoms.
2. VACCINIUM. Stamens 10 or 8: anthers tapering up into a tube with a hole at the top. Ovary with several or many ovules in each cell, forming a pulpy many-seeded (rarely rather few-seeded) berry.
3. CHIOGENES. Stamens 8: anthers with short cells minutely 2-pointed, and opening by a large chink down to the middle. Ovary 4-celled, in fruit a white many-seeded berry.

II. HEATH FAMILY PROPER; shrubs or small trees with calyx free from the ovary.

§ 1. HEATHS: *the corolla persisting dry and scarious long after the flowers open, enclosing the pod; the evergreen leaves needle-shaped or minute. Lobes of calyx and corolla* 4: *stamens* 8. *No scaly leaf-buds.*

4. ERICA. Corolla of various shapes, 4-toothed or 4-cleft, longer than the calyx. Pod loculicidal. Leaves needle-shaped or linear with margins revolute.
5. CALLUNA. Corolla bell-shaped, 4-parted, much shorter and less conspicuous than the 4 colored and scarious-persistent sepals; below these 2 or 3 pairs of bracts, the inner ones scale-like. Pod septicidal. Leaves very short and small, opposite, crowded, and imbricated.

§ 2. *Corolla deciduous (not remaining dry after flowering).*

* *Monopetalous (or in No.* 16 *with two of the petals nearly separate).*

+– *Fruit berry-like, containing* 5–10 *seeds or very small stones: calyx dry underneath.*

6. ARCTOSTAPHYLOS. Corolla urn-shaped, 5-toothed, enclosing the 10 stamens; their anthers opening at the top, and 2-awned on the back. Leaves alternate.

+– +– *Fruit a dry and many-seeded pod,*

++ *But enclosed in the calyx which becomes thick and fleshy, so that the fruit imitates a berry, but has a dry pod inside.*

7. GAULTHERIA. Corolla oblong or short-cylindrical, 5-toothed. Anthers 10, 4-awned or 4-pointed at top, opening only there. Leaves alternate, broad, often spicy-aromatic, evergreen.

++ ++ *Calyx dry and separate from the pod.*

a. *Corolla salver-shaped, 5-lobed; anthers opening lengthwise, not appendaged.*

8. EPIGÆA. Sepals 5, thin and scale-like, ovate-lanceolate, style slender. Leaves evergreen, reticulated, roundish.

b. *Corolla cylindrical, urn-shaped, ovate, or globular, very rarely bell-shaped, the orifice 5-toothed; anthers opening wholly or mainly at the top. All belonged to* ANDROMEDA *of Linnæus, now divided as follows.*

9. CASSANDRA. Calyx of 5 ovate and acute rigid sepals overlapping in the bud, and a pair of similar bractlets at its base. Corolla almost cylindrical. Anthers with tubular tips to the cells, and no awns on the back. Pod flattish from above, when ripe splitting into an outer layer of 5 valves and an inner cartilaginous one of 10 valves. Shrub, with leaves rather scurfy.
10. LEUCOTHOE. Calyx of 5 almost separate sepals a little overlapping in the bud. Corolla ovate-oblong or almost cylindrical. Anthers without tubular tips. Pod flattish from above, 5-valved, loculicidal. Shrubs.

11. ANDROMEDA. Calyx valvate in the early bud; no bractlets. Corolla various. Pod globular or short-ovate, 5-valved, loculicidal. Shrubs.
12. OXYDENDRUM. Calyx valvate in the bud; no bractlets. Corolla ovate. Anthers awnless. Pod conical or pyramidal, 5-valved, loculicidal. Tree.

c. *Corolla (usually large) open-bell-shaped, saucer-shaped, funnel-form, &c., 5-lobed or cleft: anthers short, without awns or other appendages, opening only by holes at the top: filaments long and slender, as is also the style: pod septicidal: leaves entire.*

= *No scaly buds: bracts green, firm, and persistent.*

13. KALMIA. Corolla broadly open, slightly 5-lobed, and with 10 pouches in which the 10 anthers are lodged until extricated by insects, when the bent elastic filaments fly up and discharge the pollen. Pod globular. Leaves evergreen. Flowers in umbels or corymb-like clusters.

= = *Flowers in umbel-like clusters from large scaly terminal buds, their thin scale-like bracts or bud-scales falling as the blossoms are developed. Calyx often minute or obsolete.*

14. RHODODENDRON. Corolla bell-shaped, funnel-form, or various. Stamens 10, often curved to the lower side. Leaves evergreen, or rarely deciduous. Pod mostly oblong.
15. AZALEA. Stamens 5, or rarely more, and leaves deciduous: otherwise nearly as in Rhododendron. And the characters run together, so that Azaleas would hardly be kept distinct, except that they are so familiar in cultivation.
16. RHODORA. Like Azalea, but the corolla strongly irregular, the upper part 3-lobed, the lower of 2 almost or quite separate petals; and stamens 10.

* * *Polypetalous or nearly so: the (white) corolla of 5 equal petals,*

+– *Widely spreading, oval or obovate: leaves evergreen: flowers in a terminal umbel.*

17. LEIOPHYLLUM. Stamens 10: anthers opening lengthwise. Pod 2–3-celled. Leaves small, smooth both sides, glossy, mostly opposite.
18. LEDUM. Stamens 5–10: anthers opening by holes at top. Pod 5-celled. Leaves alternate, thinnish, rusty-woolly underneath. Flowers from scaly terminal buds, as in Azalea.

+– +– *Petals less spreading: leaves deciduous: flowers in hoary racemes.*

19. CLETHRA. Sepals and obovate-oblong petals 5. Stamens 10: anthers arrow-shaped and reflexed in the bud, the hole at the top of each cell then at the bottom. Style 3-cleft at the apex. Pod 3-valved, 3-celled, enclosed in the calyx. Leaves alternate, serrate, feather-veined, deciduous.

III. PYROLA FAMILY; evergreen herbs or nearly so, with calyx free from the ovary, corolla of separate petals, anthers turned outwards in the bud, soon inverted, when the holes by which they open are at top. Seeds innumerable, with a loose cellular coat.

20. PYROLA. Flowers in a raceme on a scape which bears rounded leaves at base. Petals roundish, more or less concave. Stamens 10, with awl-shaped filaments. Style long. Valves of pod cobwebby on the edges.
21. MONESES. Flower solitary, with orbicular widely spreading (sometimes only 4) petals, conspicuously 2-horned anthers, large 5-rayed stigma on a straight style, and pod as in the next genus: otherwise like Pyrola.
22. CHIMAPHILA. Flowers several in a corymb or umbel, with orbicular widely-spreading petals, 2-horned anthers on filaments enlarged and hairy in the middle. Very short top-shaped style covered by a broad orbicular stigma, and valves of pod smooth on the edges. Stems leafy below: leaves narrow, smooth and glossy.

IV. INDIAN PIPE FAMILY; herbs destitute of green foliage, parasitic on roots of other plants; commonly represented by one common genus, viz.

23. MONOTROPA. Calyx or 2 or more deciduous bract-like scales. Corolla of 4 or 5 erect spatulate or wedge-shaped petals, resembling the scales of the stem. Stamens 8 or 10: anthers kidney-shaped, opening across the top, style stout: stigma depressed. Pod 4–5-celled, seeds innumerable, minute, resembling fine sawdust.

1. GAYLUSSÁCIA, HUCKLEBERRY or AMERICAN WHORTLEBERRY. (Named for the French chemist *Gay-Lussac.*) Flowers white tinged with reddish, in late spring: the edible fruit ripe late in summer, that of the first species largely gathered for the market.

G. resinòsa, COMMON or BLACK H. Low or rocky ground, common except S. W., 1° – 3° high, clammy-resinous when young, with rigid branches, oval leaves, short one-sided racemes in clusters, rather cylindrical corolla, and black fruit without a bloom.

G. frondòsa, BLUE-TANGLE or DANGLEBERRY. Low grounds from New England S., with diverging slender branches, pale leaves white beneath, slender racemes and pedicels, short corolla, and sweet blue-black fruit with a bloom.

G. dumòsa, DWARF H. Sandy soil near the coast, rather hairy or bristly, with thickish rather shining oblong leaves, long racemes, leaf-like oval bracts to the pedicels, bell-shaped corolla, and insipid black fruit.

2. VACCÍNIUM, CRANBERRY, BLUEBERRY, &c. (Ancient Latin name, of obscure meaning.) Berry edible. (Lessons, p. 96, fig. 274.)

§ 1. BLUEBERRIES, beyond New England commonly called HUCKLEBERRIES, *with leaves deciduous at least in the Northern States; flowers in spring in clusters from scaly buds separate from and rather earlier than the leaves; corolla oblong or short cylindrical, 5-toothed, enclosing the* 10 *anthers, berries ripe in summer, sweet, blue or black with a bloom, each of the* 5 *many-seeded cells divided into two.*

V. Pennsylvánicum, DWARF EARLY BLUEBERRY. Dry or barely moist grounds N. and E.: 6′ – 15′ high, with green angular branches, mostly lance-oblong leaves bristly-serrulate and smooth and shining both sides, the sweet berries earliest to ripen.

V. Canadénse, CANADA B. Low grounds only N., is taller, 1° – 2° high, the broader entire leaves and branchlets downy.

V. vacíllans, LOW PALE B. Dry woodlands, less northern; 1° – 3° high, with yellowish branches, smooth and pale or glaucous leaves obovate or oval and entire, and berries ripening later than the first.

V. tenéllum, SOUTHERN B. Low grounds from Virginia S.; 1° – 3° high, with greenish branches rather pubescent, obovate-oblong or oblanceolate leaves scarcely serrulate and often pubescent, ½′ – 1′ long.

V. corymbòsum, COMMON SWAMP B. N. & S. in wet or low grounds: 3° – 10° high, with oval or oblong leaves, either smooth or downy, pale or green, and sweetish berries ripening in late summer; in one downy-leaved variety pure black without a bloom.

§ 2. EVERGREEN BLUEBERRIES *of the South, in low pine barrens, procumbent or only* 1° – 2° *high, with* 5*-toothed corolla and* 10 *stamens.*

V. myrsinites, with stems 6′ – 20′ high, lanceolate or lance-obovate leaves ½′ – 1′ long and mostly pale beneath, and black or blue berries.

V. crassifòlium, with procumbent slender stems, thick and shining oval or oblong leaves ½′ or less in length, their margins revolute, globular-bell-shaped corolla, and black berries.

§ 3. FARKLEBERRY and DEERBERRY; *erect shrubs with single axillary or racemed flowers on slender pedicels, in early summer, open-bell-shaped corolla,* 10 *stamens, anthers with very slender tubes and* 2 *awns on the back, and insipid berries ripening late, each of their* 5 *cells divided into two, and maturing few seeds.*

V. arbòreum, FARKLEBERRY. Open woods from Virg. and S. Ill. S.: 8° – 15° high, evergreen far S., with oval glossy leaves, anthers included in the 5-toothed white corolla, and black mealy berries.

V. stamíneum, DEERBERRY or SQUAW-HUCKLEBERRY. Dry woods, N. & S.: 2° – 3° high, rather downy, with dull and pale ovate or oval leaves, anthers much longer than the greenish or whitish 5-cleft corolla, and large greenish berries.

§ 4. CRANBERRY; *creeping or trailing very slender hardly woody plants, with small evergreen leaves whitish beneath, single flowers in summer, borne on slender erect pedicels, pale rose corolla deeply parted into* 4 *narrow reflexed divisions,* 8 *anthers with very long tubes but no awns on the back, and acid red berry* 4*-celled, ripe in autumn.*

V. Oxycóccus, SMALL C. Cold peat-bogs N. & E.: a delicate little plant, flowering at the end of the stems, the ovate acute leaves (only $\frac{1}{4}'$ long) with strongly revolute margins, berry only half as large as in the next, often speckled with white, seldom gathered for market.

V. macrocárpon, LARGE or AMERICAN C. Bogs from Virginia N.; with stems 1° to 3° long, growing on so that the flowers become lateral, oblong obtuse leaves sometimes $\frac{1}{2}'$ long, and with less revolute margins, and berries $\frac{1}{2}'$ or more long; largely cultivated for the market E.

3. CHIÓGENES. (Greek-made name, alluding to the snow-white berries.)

C. hispídula, CREEPING SNOWBERRY. Cool peat-bogs and low mossy woods N.; with nearly herbaceous slender creeping stems, very small ovate pointed evergreen leaves, their lower surface and the branchlets beset with rusty bristles, minute axillary flowers in late spring, and white berries ripe in summer: these and the foliage have the flavor of Aromatic Wintergreen.

4. ERÌCA, HEATH. (Ancient Greek name.) All belong to the Old World. The Heaths of the conservatories, blooming in winter, belong to various species from Cape of Good Hope. Of the European species one bears the winter well at the North, and is planted, viz.

E. càrnea (in the form called E. HERBÀCEA), of the Alps; a low undershrub, with linear blunt leaves whorled in fours, and rosy or bright flesh-colored flowers, with narrow corolla rather longer than calyx, in early spring.

5. CALLÙNA, HEATHER, LING. (Name from Greek, *to sweep,* brooms being made from its twigs in Europe.)

C. vulgàris, COMMON H. of North Europe, seldom planted, very sparingly found wild in E. New England and Nova Scotia, &c.: fl. summer.

6. ARCTOSTÁPHYLOS, BEARBERRY (the name in Greek).

A. Uva-Úrsi, COMMON B.; trailing over rocks and bare hills N., forming mats, with thick smooth and entire obovate or spatulate evergreen leaves, and small scaly-bracted nearly white flowers in a short raceme, in early spring, followed by the red austere berries. Leaves used in medicine, astringent and somewhat mucilaginous.

7. GAULTHÈRIA, AROMATIC WINTERGREEN, &c. (Named for *Dr. Gaulthier* or *Gaultier* of Quebec, over 130 years ago.)

G. procúmbens, CREEPING W., BOXBERRY, CHECKERBERRY, &c.; common in evergreen and low woods, spreading by long and slender mostly subterranean runners, sending up stems $3' - 5'$ high, bearing at summit a few obovate or oval leaves and in summer one or two nodding white flowers in the axils, the edible red "berries" lasting over winter: these and the foliage familiar for their spicy flavor, yielding the *oil of wintergreen*

G. Shállon, in the shade of evergreen woods of Oregon, &c., and sparingly planted, a shrub spreading over the ground, with glossy ovate slightly heart-shaped leaves about $3'$ long, and flowers in racemes.

8. EPIGÆA. (Name in Greek means *on the ground,* from the growth.)

E. rèpens, TRAILING ARBUTUS, GROUND LAUREL, or, in New England, MAYFLOWER. Sandy or some rocky woods, chiefly E., under pines, &c.; pros-

trate, with rusty-bristly shoots, somewhat heart-shaped leaves slender-petioled, and small clusters of rose-colored or almost white spicy-fragrant flowers in early spring.

9. CASSÁNDRA, LEATHER-LEAF. (A mythological name.)

C. calyculàta. Wet bogs N. and mostly E.; low much branched shrub, with small and nearly evergreen dull oblong leaves sprinkled with some fine scurf or scaly atoms, and small white flowers in the axils of the upper leaves forming one-sided leafy racemes, in early spring.

10. LEUCÓTHOË. (Mythological name.) Flowers white, in naked scaly-bracted racemes or spikes, which are formed in summer and open the next year.

§ 1. *Evergreens on moist banks of streams, with very smooth and glossy finely and sharply serrate leaves; the rather catkin-like dense racemes sessile in their axils; bractlets at the base of the short pedicels; flowers in spring, exhaling the scent of Chestnut-blossoms.*

L. Catesbæi, abounds from Virginia S. along and near the mountains, with long recurving branches, ovate-lanceolate and very taper-pointed leaves on conspicuous petioles, and narrowish sepals.

L. axillàris, belongs to the low country S., flowers very early, has broader less pointed leaves on very short petioles, and broad-ovate sepals.

§ 2. *Deciduous-leaved, with one-sided looser racemes at the ends of the branches, flowering in late spring or summer after the membranaceous leaves are developed; bractlets close to the calyx, acute.*

L. racemòsa. Low grounds E. & S.; erect, 4° – 8° high, with oblong acute serrulate leaves a little downy beneath, long and upright racemes, and 4-awned anthers.

11. ANDRÓMEDA. (Mythological name.) Flowers white, rarely tinged with rose, mostly in spring.

§ 1. *Flowers in naked one-sided racemes crowded at the end of the branches, formed in summer and opening early the next spring: leaves evergreen.*

A. floribúnda. Along the Alleghanies S. and planted for ornament; 3° – 10° high, very leafy, the lance-oblong acute leaves serrulate with very fine bristly teeth, abundance of handsome flowers, the ovate-urnshaped corolla strongly 5-angled; anthers 2-awned low on the back.

§ 2. *Flowers in umbel-like clusters: leaves evergreen: stamens 2-awned.*

A. polifòlia. Cold wet bogs N.; 6′ – 18′ high, smooth and glaucous; with lanceolate entire revolute leaves white beneath, flowers in a simple terminal umbel, the corolla almost globular.

A. nítida. Low pine-barrens from North Carolina S.; 2° – 6° high, very smooth, with 3-angled branchlets, ovate or oblong and entire glossy leaves, abundant honey-scented flowers in numerous axillary clusters, and ovate-cylindrical corolla.

§ 3. *Flowers in umbel-like clusters on wood of the previous year, in late spring or early summer: leaves mostly deciduous, but often thickish or coriaceous: pods 5-angled by a prominent rib or ridge at the lines of opening.*

* *Flowers ½′ or more long, nodding, smooth, clustered mostly on leafless shoots: stamens 2-awned. Smooth ornamental shrubs, 2° – 4° high.*

A. speciòsa. Low barrens S., barely hardy N. in cultivation; with oval or oblong blunt and serrate leaves, often mealy-whitened; corolla open bell-shaped.

A. Mariàna, STAGGER-BUSH (the foliage said to poison lambs and calves). Low grounds E. & S.; with glossy oval or oblong entire veiny leaves, and leaf-like lanceolate sepals half the length of the almost cylindrical corolla.

* * *Flowers very small, with globular and scurfy-pubescent corolla. Rusty pubescent or scurfy shrubs, 4° – 10° high.*

A. ferruginea. Low sandy grounds S. with thick and rigid mostly evergreen rusty obovate leaves, the margins revolute.

A. ligustrina. Low grounds E. & S.; with thin and green obovate-oblong leaves, and panicled clusters of small flowers.

12. OXYDÉNDRUM, SORREL-TREE, SOUR-WOOD. (Both the Greek-made and English names refer to the sour-tasted leaves.) One species.

O. arbòreum. Rich woods, Penn. to Ohio and S.; tree 15° – 40° high, smooth, with oblong-lanceolate pointed serrulate leaves (resembling those of the Peach), on slender petioles, and white flowers in long one-sided racemes clustered in a loose panicle at the end of the branches of the season, in early summer.

13. KÁLMIA, AMERICAN or MOUNTAIN LAUREL. (Named for *Peter Kalm*, pupil of Linnæus, who travelled in this country before the middle of the last century.) Ornamental shrubs, scarcely found W.: foliage thought to poison cattle. Fl. spring and early summer.

K. latifòlia, Large Mountain-L., also Calico-bush, Spoon-wood, &c., in Middle States. Common N. in damp grounds and along the mountains S., where it forms very dense thickets, 4° – 10° or even 20° high, with mostly alternate lance-ovate leaves bright green both sides; the large and showy clusters of rose-color or white or crimson-spotted flowers terminal and clammy, in early summer.

K. angustifòlia, Narrow-leaved or Sheep L., Lamkill. Low or dry grounds; 2° – 3° high, with narrow-oblong short-petioled leaves opposite or in threes and pale beneath, and corymbs of smaller crimson-purple flowers lateral (in late spring), their pedicels recurved in fruit.

K. glaùca, Pale L. Cold bogs N.; 1° – 2° high, with 2-edged branches, opposite sessile oblong or linear leaves white beneath and with revolute margins, the corymbs of lilac-purple flowers terminal, in spring.

14. RHODODÉNDRON, ROSE-BAY. (The name in Greek means *Rose-tree.*) Very ornamental shrubs or small trees. Calyx in our species small or minute.

* *Leaves thick and evergreen, smooth: branches stiff and erect: flowers in early summer from very large terminal buds: corolla broadly bell-shaped.*

R. máximum, Great R. or Wild Laurel. Mountain-sides, abundant through the Alleghanies, and N. sparingly to Maine and Canada; 6° – 20° high, with lance-oblong leaves (4′ – 10′ long) narrowish below, clammy pedicels, and pale rose or nearly white corolla (1′ broad) greenish in the throat, on the upper side more or less spotted with yellow or reddish: fl. midsummer.

R. Catawbiénse, Catawba R. High Alleghanies from Virginia S., and planted; 3° – 6° high, with oval or oblong leaves rounded at both ends and pale beneath (3′ – 5′ long), usually rusty pedicels, and large purple corolla: fl. early summer. This, hybridized with other less hardy species, especially with the next, and with the tender **R. arboreum** of the Himalayas (cult. in conservatories) gives rise to most of the various Rhododendrons of ornamental grounds.

R. Pónticum, from Pontus, &c., hardy when planted N. only as a low shrub, has obovate-lanceolate leaves tapering to the base, and a very open bell-shaped purple corolla, in late spring.

* * *Leaves evergreen, but thinnish; branches slender and spreading or drooping: flowers in early summer.*

R. punctàtum, Dotted R. Along the mountains E. from N. Carolina S., and sparingly planted; 4° – 6° high, with oblong or lance-oblong leaves acute at both ends, 2′ – 4′ long, and sprinkled, like the branchlets and outside of the rather small short funnel-shaped rose-colored corolla, with rusty dots or atoms.

* * * *Leaves tardily deciduous, thickish: flowers borne on the naked shoots in earliest spring: corolla almost wheel-shaped, bright rose-purple.*

R. Daùricum, cult. from Siberia; a low shrub, with small oblong leaves (1′–2′ long) sprinkled with minute dots, becoming rusty beneath.

15. AZÀLEA. (Name in Greek means *arid;* not applicable to these ornamental shrubs, which grow in low, wet, or shady grounds.)

§ 1. Chinese Azaleas, *with thickish almost or quite evergreen leaves, rather leafy calyx, short-tubed corolla approaching to bell-shaped, and often* 10 *stamens, — therefore in strictness rather* Rhododendrons:

A. Índica, cult. from China and Japan, &c., is however the Azalea of florists, flowering in late winter and early spring in conservatories, with red, purple, pink, white or variegated showy flowers, green rather shining leaves, and shoots beset with appressed awl-shaped rusty bristles.

§ 2. True Azaleas or False Honeysuckles, *with deciduous leaves, slender cylindrical tube to the corolla, the chiefly* 5 *stamens and the style long and protruded: hardy ornamental shrubs.*

* *Flowers developed later than the leaves, in summer, very fragrant.*

A. viscòsa, Clammy A. Swamps E. & S.; 4°–10° high, with bristly branchlets, oblong-obovate mostly smooth leaves commonly pale or whitish beneath, often glossy above, and white or rosy-tinged very clammy flowers.

* * *Flowers developed with or rather before the thin and veiny mostly pubescent leaves, in late spring, slightly fragrant.*

A. nudiflòra, Purple A. or Pinxter-flower. Swamps, chiefly E. & S.; 3°–6° high, with oblong or obovate leaves; branchlets and narrow tube of the rose or pink-red corolla rather glandular-pubescent, and calyx very small.

A. calendulàcea, Flame-colored A. In and near the Alleghanies, especially S., and cult. in hybrid forms; has yellow or flame-colored corolla and larger calyx-lobes than the preceding.

A. Póntica, planted from the Old World, a native of the Caucasus; has larger (2′ or more broad) golden or orange-yellow flowers, terminating naked branches, the tube clammy-downy.

16. RHODÒRA. (Name made from the Greek word for *Rose,* from the color of the flowers and general likeness to Rhododendron.)

R. Canadénsis. Cold wet grounds, from Penn. N. & E.: low shrub, with handsome rose-pink flowers in spring, somewhat earlier than the pale rather hairy leaves.

17. LEIOPHÝLLUM, SAND-MYRTLE. (Name from the Greek, meaning *smooth leaf*.)

L. buxifòlium. In sand, from New Jersey S.; evergreen shrub a few inches high, much branched, with oval or oblong Myrtle-like leaves (from ¼′ to near ½′ long), and umbels of small white flowers in late spring.

18. LÈDUM, LABRADOR TEA. (An old Greek name.) Fl. early summer.

L. latifòlium, Common or Broad-leaved L. Low and damp or wet grounds from Penn. N.; 2°–5° high, with oblong leaves, usually 5 stamens, and oblong pods.

19. CLÈTHRA, WHITE ALDER. (Old Greek name of Alder, from some resemblance in the foliage.) Fl. in summer.

C. alnifòlia, the only common species, in low grounds, 3°–10° high, with wedge-obovate sharply serrate straight-veined leaves, and upright panicled racemes of fragrant small flowers.

20. PÝROLA, WINTERGREEN, SHIN-LEAF. (Old name, diminutive of *Pyrus*, the Pear-tree, the application not obvious.) Flowers mostly greenish-white, in summer.)

* *Flowers nodding, the petals partly expanding, the hanging style more or less curved, tipped with a narrow stigma, and stamens ascending.*

P. rotundifòlia. Damp or sandy woods; has thick and shining round leaves on short petioles, many-flowered raceme, and blunt anthers: a variety in bogs has rose-purple flowers.

P. ellíptica. Rich woods N.; has thinnish and dull upright leaves on rather long and margined petioles; the greenish-white flowers nearly as in the preceding.

P. chlorántha. Open woods N.; smaller, the scape only 5′ – 6′ high, with a few greenish-white flowers, thick but dull roundish leaves only 1′ long, and anthers short-horned.

* * *Flowers all turned to one side, rather spreading than nodding, the petals conniving, stamens and style straight, stigma large and 5-rayed.*

P. secúnda. Rich woods N. & E.: slender, 3′ – 6′ high, with thin ovate leaves and dense spike-like raceme.

21. MONÈSES, ONE-FLOWERED WINTERGREEN. (Name, from the Greek, refers to the solitary flower.) Flowering in early summer.

M. uniflòra. Cold woods N. E.: with roundish and serrate veiny leaves about ½′ long, scape 2′ – 4′ high, and rather large white or rose-colored flower.

22. CHIMÁPHILA, PIPSISSEWA or PRINCES-PINE. (Name from Greek, means *lover of winter*, i e. Wintergreen.) Plants of dry woods, branched at base, 3′ – 10′ high, with fragrant wax-like mostly flesh-colored flowers, in early summer.

C. umbellàta, Common P. Leaves wedge-lanceolate, sharply serrate, not spotted; flowers 4 – 7, with violet-colored anthers.

C. maculàta, Spotted P. Lower, 3′ – 6′ high, with ovate-lanceolate remotely toothed leaves blotched with white, and 1 – 5 flowers.

23. MONÓTROPA, INDIAN PIPE. (Name from the Greek, refers to the flower or summit of the stem turned over to one side or hanging: in fruit it straightens.) Fl. summer.

M. uniflòra, Common Indian Pipe or Corpse-plant; in rich woods, smooth, waxy-white all over, 3′ – 6′ high, with one rather large nodding flower of 5 petals and 10 stamens.

M. Hypópitys, Pine-sap or False Beech-drops; in Oak and Pine woods; rather downy, tawny or reddish, fragrant, 4′ – 12′ high, with several smallish flowers in a scaly raceme, having 4 petals and 8 stamens, or the uppermost 5 petals and 10 stamens.

65. AQUIFOLIACEÆ, HOLLY FAMILY.

Trees or shrubs, with alternate simple leaves, small mostly polygamous or dicœcious axillary flowers, having divisions of the free calyx, petals (these almost or quite distinct), stamens (alternate with petals), and cells of the ovary of the same number (4 – 6 or even 9, and fruit berry-like, containing 4 – 6 single-seeded little stones. Solitary ovule hanging from the top of each cell. Sessile stigmas 4 – 6, or united into one. Flowers white.

Nemopánthes Canadénsis, sometimes called Mountain Holly, shrub with slender petals and large dull red berries, in cold woods or bogs N., is the only representative besides the species of

1. ÌLEX, HOLLY. (Ancient Latin name, which however belonged rather to an Oak than to Holly.) Fl. early summer: fruit autumn.

§ 1. TRUE HOLLY, *with thick and rigid evergreen leaves, red berries, and parts of the flowers in fours, rarely some in fives or sixes.*

I. Aquifòlium, EUROPEAN HOLLY, is occasionally planted, not quite hardy N.; tree with more glossy and spiny leaves, and brighter red berries than

I. opàca, AMERICAN H. Low grounds from E. New England S.; tree 20° – 40° high, smooth, with gray bark, oval leaves wavy-margined and spiny-toothed.

I. Dahòon, DAHOON H. Shrub or small tree, of low pine-barrens from Eastern Virginia S., a little downy, with obovate or oblong-linear short-petioled leaves sparingly toothed above the middle; or, var. MYRTIFÒLIA, with narrower leaves barely 1′ long and mostly entire.

I. Cassine, YAUPON H. Shrub on the sandy coast S., with oblong or lance-ovate crenate leaves only 1′ long, and flowers in sessile clusters. Leaves used for *Yaupon tea.*

§ 2. PRINOS, &c., *shrubs with deciduous mostly thin leaves, and red berries.*

* *Parts of the flower* 4, 5, *rarely* 6: *nutlets striate on the back.*

I. decídua. Wet grounds S. & W.; with wedge-oblong or lance-obovate obtusely serrate leaves downy on the midrib beneath, when old glossy above, and with acute calyx-lobes.

I. ambígua. Wet grounds S.; with the thin oval or oblong pointed leaves smooth or smoothish and sharply serrate, and obtuse ciliate calyx-lobes.

I. móllis. Shady grounds along the Alleghanies from Penn. S.; like the last, but soft-downy, and fertile peduncles very short.

* * *Parts of the blossom* 6 (*or sometimes* 5 – 9) *in the fertile,* 4 – 6 *in the sterile flowers: nutlets of the berry smooth and even.*

I. verticillàta, COMMON WINTERBERRY or BLACK ALDER. Common in low grounds; with obovate or wedge-lanceolate serrate leaves (1½′ – 2′ long) acute or pointed at both ends, the lower surface often downy, very short-peduncled flowers mostly clustered, and very bright scarlet-red berries ripening late in autumn. There is nothing whorled in the leaves or flowers, so that the name is rather misleading.

I. lævigàta, SMOOTH W. Wet grounds along the coast of New England to Virginia; has smoother and narrower minutely serrate leaves glossy above, long-peduncled sterile flowers, and larger less bright berries ripening earlier.

§ 3. INKBERRY; *shrubs with thickish evergreen leaves glossy above, often blackish-dotted beneath, parts of the flower* 6, *or rarely* 7 – 9, *and with black astringent berries, their nutlets smooth and even.*

I. glàbra, COMMON INKBERRY. Along sandy coast from Mass. S., 2° – 4° high; with wedge-oblong few-toothed near the apex, flowers several on the sterile, solitary on the fertile peduncles.

I. coriàcea. Wet soil from Carolina S.; 4° – 8° high, with larger obovate-oblong or oval leaves entire or with scattered sharp teeth.

66. EBENACEÆ, EBONY FAMILY.

Trees, with hard wood, no milky juice, alternate entire leaves, from 2 to 4 times as many stamens as there are lobes to the corolla, several-celled ovary, with a single ovule hanging in each cell, and berry with large hard-coated seeds. Represented only by

1. DIOSPÝROS, PERSIMMON, DATE-PLUM. (Ancient Greek name.) Flowers polygamous or dicœcious, the fertile ones single in axils of leaves, the sterile smaller and often clustered. Calyx and corolla each 4 – 6-lobed. Stamens about 16 in the sterile, 8 imperfect ones in the fertile flowers,

inserted on the tube of the corolla: anthers turned inwards. Berry edible when very ripe, plum-like, globular, surrounded at base by the persistent thickish calyx. Fl. early summer.

D. Virginiàna, COMMON P. Southern New England to Illinois and S.: tree 20° – 60° high, with very hard blackish wood, nearly smooth thickish ovate leaves, very short peduncles, 4-parted calyx, pale yellow 4-cleft corolla, 4 styles 2-lobed at tip, 8-celled ovary, and plum-like fruit green and very acerb, but yellow, sweet, and eatable after frost.

67. SAPOTACEÆ, SAPPODILLA FAMILY.

Mainly tropical trees or shrubs, with hard wood, and in other respects also resembling the last family, but mostly with milky juice, perfect flowers, anthers turned outwards, erect ovules, and bony-coated seeds. Represented S. by a few species of

1. BUMÈLIA. (Ancient name of a kind of Ash, transferred to this genus.) Flowers small, white or whitish, in clusters in the axils of the leaves. Calyx 5-parted. Corolla 5-cleft, and with a pair of internal appendages between the lobes, 5 good stamens before them, and as many petal-like sterile ones or scales alternating. Ovary 5-celled, hairy: style 1, pointed. Fruit cherry-like, containing a single large stony-coated seed. Small trees or shrubs, with branches often spiny, and deciduous but thickish leaves entire. Fl. summer: fruit purple or blackish. Natives of river-banks, &c.

B. lycioides, from Virginia to Illinois and S., is smooth, with obovate-oblong or lance-wedge-shaped leaves 2′ – 4′ long, and greenish flowers.

B. tènax, still more southern, has smaller leaves brown-silky underneath, and a shorter white corolla.

B. lanuginòsa, in dry soil from S. Illinois S.; has leaves rusty-hairy or woolly beneath, and white corolla.

68. STYRACACEÆ, STORAX FAMILY.

Shrubs or trees, with alternate simple leaves, perfect flowers with 4 – 8 petals more or less united at the base, and bearing twice as many or indefinitely numerous partly monadelphous or polyadelphous stamens, only one style, and a 1 – 5-celled 1 – 5-seeded fruit. Ovules as many as 2 in each cell. Calyx in ours coherent more or less with the 2 – 4-celled ovary.

1 STYRAX. Flowers from the axils of the leaves, white, showy, on drooping peduncles. Calyx scarcely 5-toothed, its base coherent merely with the base of the 3-celled many-ovuled ovary. Corolla open bell-shaped, mostly 5-parted, rather downy outside. Stamens twice as many as the lobes of the corolla, with flat filaments monadelphous at base, and linear anthers. Fruit dry, 1-celled, with usually only one globular hard-coated seed at its base.

2. HALESIA. Flowers in fascicles on hanging pedicels from the axils of the deciduous leaves of the preceding year, white, showy. Calyx 4-toothed, the tube wholly coherent with the 2 - 4-celled ovary. Petals 4, or united into a bell-shaped corolla. Stamens 8 – 16: filaments monadelphous at the base: anthers linear-oblong. Ovules 4 in each cell. Fruit large and dry, 2 – 4-winged, within bony or woody and 1 – 4-celled, a single seed filling each slender cell.

3. SYMPLOCOS. Flowers yellow, in the axils of the thickish leaves, not drooping. Calyx 5-cleft, coherent with the lower part of the 3-celled ovary. Petals 5, broad, nearly separate. Stamens very many in 5 clusters, one attached to the base of each petal: filaments very slender: anthers very short. Fruit 1-celled, 1-seeded, small and dry.

1. STŸRAX, STORAX. (The ancient Greek name.) Leaves, &c. with some scurf or starry down. Shrubs, in low pine woods or barrens, from Virginia S.: fl. late spring.

S. grandifòlia, has obovate leaves (2′–6′ long) white downy beneath, and flowers mostly numerous in racemes.

S. pulverulénta, has oval or obovate leaves less than 2′ long, their lower face scurfy-downy, and fragrant flowers few together or single.

S. Americàna, has oblong almost glabrous leaves acute at both ends, and flowers 2–4 together or single.

2. HALÈSIA, SNOWDROP- or SILVER-BELL-TREE. (Named for *Stephen Hales*, early writer of essays in vegetable physiology.) Tall shrubs or small trees, flowering in spring just as the leaves appear.

H. tetráptera, FOUR-WINGED H. Along streams from Virginia and the Ohio River S., planted for ornament and hardy N.: tall, smoothish, with oblong finely serrate leaves, 4-lobed corolla, 12–16 strongly monadelphous stamens, and 4-winged fruit.

H. díptera, TWO-WINGED H., confined to low country S.; has coarsely serrate more downy oval leaves, 4 nearly distinct petals (1′ long), 8–12 nearly distinct stamens, and 2-winged fruit.

3. SŸMPLOCOS. (A Greek name, means *growing together.*) Fl. spring.

S. tinctòria, SWEET-LEAF, HORSE-SUGAR. Shrub or small tree, in rich ground S., with coriaceous oblong nearly entire almost evergreen leaves, pale beneath, and small odorous flowers in close sessile bracted clusters. Leaves sweet-tasted, greedily eaten by cattle.

69. PLANTAGINACEÆ, PLANTAIN FAMILY.

Consists almost entirely of the very familiar weedy genus

1. PLANTÀGO, PLANTAIN, RIBGRASS. (The old Latin name.) Flowers in a spike, on a naked scape, small, whitish. Sepals 4 (or rarely 3 from two of them growing together), imbricated, persistent. Corolla short salver-form, thin and membranaceous, usually becoming scarious and dry, or withering on the pod; lobes 4. Stamens 4 (or rarely 2) borne on the tube of the corolla: filaments usually lengthening suddenly at flowering time and hanging (as in Grasses), bearing the 2-celled anthers. Style and long hairy stigma single and thread-like. Ovary 2-celled. Pod 2-celled, a *pyxis*, the top falling off as a lid, and the partition then falling out along with the 2 or more seeds. Leaves parallel-ribbed, all from the ground. The following are the common species: fl. summer.

§ 1. *Flowers all alike and perfect, in each the style protruded a day or two before the anthers open or are hung out: lobes of corolla remaining wide open.*

P. màjor, COMMON PLANTAIN, in yards, &c. Usually smooth or smoothish, with ovate or oval 5–7-ribbed leaves, a slender spike, and 7–16-seeded pod. ♃

P. lanceolàta, RIBGRASS, RIPPLEGRASS, or ENGLISH PLANTAIN. Nat. from Eu. in fields: rather hairy, with lanceolate or lance-oblong 3–5-ribbed leaves, a grooved-angled scape, thick and close spike, two of the sepals mostly united into one, and 2-seeded pod. ♃

P. marítima, SEASIDE P. Salt-marshes N. E.; smooth, with linear thick and fleshy sometimes almost terete leaves. showing no ribs, slender spike, and 2–4-seeded pod. ① ♃

§ 2. *Flowers almost diœcious, or of 2 sorts, one with 4 long stamens and open corolla, the other with minute short stamens, and corolla closing permanently over the pod.*

P. Virgínica. Sandy grounds mostly S.: small, pubescent, with obovate or lance-spatulate 3–5-ribbed leaves, a small spike, and 2-seeded pod.

70. PLUMBAGINACEÆ, LEADWORT FAMILY.

Known by the flowers with parts five throughout, viz. 5-lobed plaited calyx, 5 stamens opposite as many petals or lobes of the corolla and almost separate from them, 5 styles or 5 stigmas, and the free ovary 1-celled, containing a single ovule hanging on a slender stalk which rises from its base; the fruit a small utricle.

§ 1. *Low hardy herbs, with leaves all from the root, and flowers on scapes, having a funnel-shaped scarious calyx, nearly or quite separate petals tapering at base, and 5 almost or quite separate styles.*

1. ARMERIA. Tufted plants with evergreen very narrow and entire leaves, simple scapes bearing a head of rose-colored flowers, and styles plumose-hairy towards the base.
2. STATICE. Broadish-leaved herbs, with scapes branching into a panicle, bearing 3-bracted flowers or clusters: styles smooth.

§ 2. *Plants of warm regions, with branching mostly woody stems bearing alternate entire leaves, and bracted spikes of handsome flowers, having a tubular calyx and corolla, and one style bearing 5 stigmas.*

3. PLUMBAGO. Calyx 5-toothed at the apex, glandular along the 5 ribs or angles. Corolla salver-form, with long tube.

1. ARMÈRIA, THRIFT. (Old Celtic name latinized.) Fl. summer. ♃

A. vulgàris (also called A. MARÍTIMA), COMMON THRIFT, wild on shores of Europe, &c., cult. in gardens for edgings, &c., with short spreading leaves and scape 3′ – 6′ high.

2. STÁTICE. (Ancient Greek, meaning *astringent*, the roots used as such in popular medicine.) A few species of the Old World are cult. in choice gardens, but not commonly. ♃

S. Limònium, SEA-LAVENDER or MARSH-ROSEMARY. Along the coast in salt-marshes: with oblong or spatulate thick and pale leaves on slender petioles, scapes 1° – 2° high, bearing lavender-colored flowers all summer.

3. PLUMBÀGO, LEADWORT (which the Latin name denotes). The following are cult. in conservatories, or turned out to flower all summer.

P. Capénsis, CAPE L., with somewhat climbing angled stems, oblong spatulate leaves, and large pale or lead-blue corolla, the tube 1½′ long.

P. coccínea, RED-FLOWERED L., of the East Indies, is more tender, with deep red flowers.

P. Zeylánica, WHITE-FLOWERED L., of the East Indies, with smaller white flowers.

71. PRIMULACEÆ, PRIMROSE FAMILY.

Herbs with regular perfect flowers, the stamens borne on the corolla, and as many as its divisions and opposite them, one style and stigma, and many or sometimes few ovules on a free central placenta of the one-celled ovary, in fruit a pod.

§ 1. *With leaves all from the root and simple, the flowers on a scape,*

* *From a fibrous-rooted crown or root-stock.*

1. PRIMULA. Calyx 5-toothed or 5-cleft, often angled. Corolla salver-shaped or funnel-shaped with 5 spreading lobes; the stamens included in its tube. Pod opening by valves or teeth at the top. Flowers in an umbel, which is sessile in one species, but usually raised on a scape.
2. DODECATHEON. Calyx 5-parted, reflexed. Corolla 5-parted; the divisions lanceolate, strongly reflexed. Stamens conniving in a long slender cone, the linear anthers very much longer than the short partly monadelphous filaments. Pod splitting into 5 valves. Flowers in an umbel.

* * *From a depressed or biscuit-shaped fleshy corm.*

3. CYCLAMEN. Flower resembling that of Dodecatheon, but only one on a scape or stalk. Anthers sessile, pointed.

§ 2. *With leafy stems, the leaves simple and chiefly entire,*

* *In one whorl at the summit of the slender stem: parts of the flower* 7.

4. TRIENTALIS. Calyx and corolla wheel-shaped, of mostly 7 divisions united only at base, those of the former linear-lanceolate, of the latter oblong, of both pointed. Filaments united in a ring at base: anthers oblong, curving when old. Flowers white.

* * *In pairs or whorls along the stems: parts of the flower mostly* 5.

5. LYSIMACHIA. Corolla yellow, wheel-shaped, 5-parted (or rarely of 5, 6, or even 7 nearly or quite separate narrow petals). Filaments beardless, often monadelphous at base. Pod splitting into valves.

6. ANAGALLIS. Corolla red, blue, or white, wheel-shaped, the 5 divisions broad. Filaments bearded. Pod (a pyxis) open by a transverse division, the top falling off as a lid, many-seeded.

* * * *Alternate leaves along the branching stems: base of calyx and ovary coherent.*

7. SAMOLUS. Calyx 5-cleft. Corolla bell-shaped, 5-cleft, with a little body like a sterile filament in the clefts. Stamens included. Pod many-seeded, splitting into 5 valves. Flowers small, white, in racemes.

§ 3. *With hollow inflated leafy stems; the leaves whorled or scattered, the lower ones pinnately parted: parts of the flower* 5.

8. HOTTONIA. Calyx 5-parted. Corolla short salver-shaped: stamens included. Pod opening by 5 clefts down the side, many-seeded. Flowers small, in whorls along the upper part of the stem and branches.

1. PRÍMULA, PRIMROSE, COWSLIP, &c. (Name from *primus*, spring, from the flowering-time of true Primrose.) ♃ Two small species are scarce along our northern borders (see Manual): the following are the common ones cult. for ornament.

* *Tender house-plant, with inflated conical calyx, and round-heart-shaped* 7–9-*lobed leaves.*

P. Sinénsis, CHINESE PRIMROSE, a downy plant, with often proliferous umbels of large and showy flowers, purple, rose, or white, sometimes double, in one variety cut-fringed.

* * *Hardy or nearly so, from Eu., with large tubular or oblong-bell-shaped angled calyx, and wrinkled-veiny oblong or spatulate leaves tapering into short wing-margined petioles: flowers naturally yellow, in spring.*

P. grandiflòra (or ACAÙLIS), TRUE PRIMROSE, has leaves somewhat hairy beneath, and the large flowers rising on slender pedicels from their axils, the proper scapes not developed; corolla flat, sulphur-yellow.

P. officinàlis (or VÈRIS), ENGLISH COWSLIP; somewhat pubescent with minute pale down, scapes bearing the umbels above the leaves, much smaller flowers of deeper color, and the limb of corolla rather concave or cup-like, the throat commonly orange. The sorts of POLYANTHUS are cultivated varieties, with flowers enlarged, of various colors, or partycolored, often more or less double.

* * * *Scarcely hardy N., with bell-shaped calyx much shorter than the funnel-shaped corolla, and smooth and thick obovate leaves, mostly covered with some fine mealiness.*

P. Auricula, AURICULA, of Southern Europe; low, with sessile leaves, and scape bearing a few fragrant flowers, these pale yellow, with varieties white, purple, or of various hues, sometimes full double.

2. DODECÀTHEON. (Fanciful name, from Greek for *twelve gods.*) ♃

D. Meàdia, called SHOOTING-STAR at the West, or sometimes AMERICAN COWSLIP: in rich open woods from Penn. S. and especially W., and cult. for ornament; smooth, with a cluster of oblong or spatulate leaves around the base

of a simple scape, 6′ – 2° high, which has an umbel of several or many handsome rose-purple or often white flowers nodding on the slender pedicels, becoming erect in fruit: fl. late spring.

3. CÝCLAMEN. (Classical name for the wild plant of Europe called Sowbread.) Cult. in this country as house-plants for winter-flowering. Flowers rose-colored, pink, or white, nodding on the apex of the stalk, the reflexed lobes turned upwards. ♃

C. Europæum, Common C. Corm 1′ – 2′ in diameter, sending up heart-shaped thick sometimes angled leaves, often marked with white above and crimson-purple or violet beneath, on slender petioles, and flowers with open throat and oval or oblong divisions, the flower-stalks coiled up after flowering so as to bring the pod to the ground to ripen.

C. Pérsicum, Persian C., is more tender, with longer and lanceolate divisions and less open throat to the corolla, the flower-stalks not coiling after blossoming.

4. TRIENTÀLIS, CHICKWEED-WINTERGREEN. (From Latin for the third part of a foot, the usual height of the European species.) ♃

T. Americàna, American C. or Star-flower. In open low woods, especially N.: a pretty plant, the stem bearing a few scales below, and at top a whorl of long-lanceolate leaves tapering to both ends, also 2 or 3 slender-stalked delicate flowers with taper-pointed petals, in spring.

5. LYSIMÀCHIA, LOOSESTRIFE (which the name means in Greek). Fl. summer. ♃

§ 1. *Wild species of the country, in low or wet grounds: corolla yellow.*

L. thyrsiflòra. Wet swamps N.: smooth, with simple stem leafless at base, above with lanceolate sessile leaves, in the axils of one or two of them a short-peduncled oblong spike or cluster of small flowers, having slender filaments and lance-linear mostly separate purplish-dotted petals, and as many little teeth between them.

L. stricta. Common N. & S.: smooth, very leafy, branching, with mostly opposite lanceolate sessile dark-dotted leaves tapering to each end, flowers on slender pedicels in a terminal long raceme leafy at base, unequal filaments monadelphous, and lance-oblong lobes of corolla blackish-streaked.

L. quadrifòlia. Sandy moist ground: rather hairy, with ovate-lanceolate sessile leaves 4 (or 3 – 6) in a whorl, slender peduncles in the axils of the upper ones, and ovate-oblong lobes of corolla dark-streaked.

L. ciliàta. Low thickets; with erect stems 2° – 3° high, opposite dotless leaves lance-ovate with rounded or heart-shaped ciliate base and on fringed petioles, flowers nodding on slender peduncles from the upper axils, light yellow corolla not streaked nor dotted, the lobes round-ovate and wavy-margined or denticulate, little longer than the sepals.

L. radicans, from Virginia S. W., resembles the foregoing, but stems or branches reclined and rooting, and leaves and flowers smaller by half.

L. lanceolàta, commonest W. & S., is similar, but with oblong or linear leaves mostly narrowed into short and margined petioles.

L. longifòlia, from Western New York W., has similar but deeper yellow flowers, and sessile linear blunt stem-leaves of thicker texture.

§ 2. *European species in cultivated grounds, &c.*

L. vulgàris, Common L. of Europe: a rather stout downy plant, 2° – 3° high, with oblong or lance-ovate leaves 3 or 4 in a whorl, flowers in panicles, and monadelphous filaments.

L. nummulària, Moneywort: trailing and creeping in damp garden-grounds, or running wild sometimes; smooth, with opposite small round leaves, and solitary flowers in their axils on short peduncles. (Lessons, p. 73, fig. 199.)

6. ANAGÁLLIS, PIMPERNEL. (Old Greek name, meaning *delightful.*) Low herbs of the Old World, flowering all summer.

A. arvénsis, COMMON P. or POOR-MAN'S WEATHER-GLASS, the small (red, purple, or white) flowers said to close at the approach of rain; in gardens and running wild in sandy fields; spreading on the ground, with pale ovate leaves shorter than the peduncles, and rounded petals fringed with minute glandular teeth. ①

A. cærùlea, BLUE P., of the gardens, a tender mostly larger form of the preceding, with larger blue flowers. ①

7. SÁMOLUS, WATER-PIMPERNEL, BROOKWEED. (Old name, of unknown meaning.) Fl. late summer. ① ♃

S. Valerándi, var. **Americànus.** Along rills and wet places; spreading, 6′ – 10′ high, with obovate leaves, and very small flowers on slender pedicels, which bear a bractlet at the middle, but no bract at base.

8. HOTTÓNIA, WATER VIOLET or FEATHERFOIL. (Named for a *Prof. Hotton* of Holland.) Fl. summer. ♃

H. inflàta. A singular plant in pools and ditches, smooth, with stems and branches much inflated except at the joints, bearing finely cut pectinate leaves; flowers white.

72. LENTIBULACEÆ, BLADDERWORT FAMILY.

Aquatic or marsh herbs, with the ovary and pod as in Primrose Family, but with irregular bilabiate flowers bearing a spur or sac underneath, and only 2 stamens: — represented by the two following genera.

1. UTRICULARIA. Calyx parted into 2 nearly entire lips. Corolla deeply 2-lipped, the lower lip bearing above a prominent palate closing the throat, and below a large spur. Anthers 2, converging in the throat of corolla. Stigma 2-lipped. Leaves finely cut, mostly into threads or fibres, many bearing little air-bladders; some are leafless.
2. PINGUICULA. Upper lip of calyx 2-cleft, lower 2-cleft. Lips of corolla distinctly lobed, the hairy or spotted palate smaller, so that the throat is open. Otherwise as in Utricularia. Leaves all in a tuft at base of the 1-flowered scapes, broad and entire, soft and tender.

1. UTRICULÀRIA, BLADDERWORT. (*Utriculus,* a little bladder.) Fl. all summer. The following are the commonest species.

* *Floating, branching, bladder-bearing: corolla violet-purple.*

U. purpùrea. Only E. & S., with 2 – 4 flowers on the peduncle, and a rather short spur appressed to the 3-lobed lower lip of corolla.

* * *Floating, branching, bladder-bearing: corolla yellow.*

U. inflàta. Only E. & S.: swimming free, the petioles of the whorl of leaves around base of the 5 – 10-flowered scape inflated into oblong bladders, besides little bladders on the thread-like divisions of the leaves.

U. vulgàris, LARGE B. Common in still or slow water; the stems 1° – 3° long and very bladder-bearing on the thread-like many-parted leaves; flowers 5 – 10 in raceme, large, with spur rather shorter than lower lip.

U. intermèdia. Chiefly N. in shallow water, with stems 3′ – 6′ long, bearing rather rigid leaves with linear-awl-shaped divisions, and no bladders, these being on separate leafless branches, the slender raceme few-flowered; spur nearly equalling the very broad lower lip.

U. gíbba. Chiefly Middle States: small, with short branches bearing sparse thread-like leaves and some bladders, 1 – 2-flowered peduncles only 1′ – 3′ high, and blunt conical spur shorter than lower lip.

U. biflòra. Chiefly S.: stems 4′ – 6′ long, bearing rootlet-like leaves and many bladders, 1 – 3-flowered peduncles 2′ – 4′ high, and awl-shaped spur as long as lower lip.

* * * *Simple and erect naked scape-like stem rooting in wet soil, with minute and fugacious grass-like leaves seldom seen: commonly no bladders: flowers yellow.*

U. subulàta, from N. Jersey S. in wet sand; very slender, 3′ – 5′ high, with several very small slender-pedicelled flowers.

U. cornùta. In bogs N. & S.; 6′ – 15′ high, bearing 2 – 4 large flowers crowded together on short pedicels, or S. with 4 – 12 more scattered and smaller flowers.

2. PINGUÍCULA, BUTTERWORT. (Name from Latin, *pinguis,* fat. Both names from the fatty or greasy-looking leaves, which in ours are more or less clammy-pubescent.)

* *Corolla violet-purple; the upper lip 2-lobed, lower 3-lobed.*

P. vulgàris, is scarce on wet rocks along our northern borders; scape 2′ high; upper lip of corolla short; spur straightish and slender: fl. summer.

P. pùmila, in moist sand from Georgia S. & W., has rather large flower on scape 2′ - 6′ high, with blunt sac-like spur: fl. spring.

P. elàtior, borders of ponds from N. Carolina S., has scapes near 1° high, and large corolla (1′ wide) with blunt spur: fl. summer.

* * *Corolla yellow, more bell-shaped, less distinctly 2-lipped, the 5 lobes often cleft.*

P. lùtea. Wet pine barrens S.; whole plant yellowish, with nodding flower (1′ or more wide) on scape 6′ – 12′ high, in spring.

73. BIGNONIACEÆ, BIGNONIA FAMILY.

Woody plants, or a few herbs, with more or less bilabiate flowers, diandrous or didynamous stamens (often with rudiments of the wanting ones), 2-lipped stigma, free variously 1 – 4-celled ovary, and fruit, usually a pod, containing many large mostly flat and winged seeds, filled with the large embryo: no albumen.

I. BIGNONIA FAMILY PROPER; almost all woody plants, with opposite leaves, 1 – 2-celled pods, and flat winged seeds. (Lessons, p. 126, fig. 415, 416.)

§ 1. *Climbers, with compound leaves and 4 fertile stamens in two pairs.*

* *Barely woody or herbaceous: ovary and pod one-celled with 2 parietal placentæ.*

1. ECCREMOCARPUS. Calyx 5-cleft, short. Corolla tubular, with 5 short and round recurved lobes. Pod short. Seeds winged all round.

* * *Woody-stemmed: ovary and pod 2-celled, but the placentæ parietal: valves of pod falling away from the partition: seeds with a broad thin wing.*

2. BIGNONIA. Calyx nearly truncate. Corolla tubular bell-shaped, 5-lobed. Pod flattened parallel with the valves and partition. Climbing by leaf-tendrils.

3. TECOMA. Calyx 5-toothed. Corolla funnel-shaped, tubular, or bell-shaped, 5-lobed. Pod flattish or flattened contrary to the partition, the edges of which separate from the middle of the valves. Leaves in ours odd-pinnate. The hardy species climb by rootlets.

§ 2. *Trees, with simple leaves and 2 or rarely 4 fertile stamens.*

4. CATALPA. Calyx deeply 2-lipped. Corolla inflated bell-shaped, the 5-lobed border more or less 2-lipped and wavy. Pod very long and slender, hanging; the partition contrary to the valves. Narrow wings of the seed lacerate-fringed. (For corolla and stamens, see Lessons, p. 92, fig. 265.)

II. SESAMUM FAMILY, &c.; herbs, with simple leaves, some of the upper ones alternate, and 4-celled ovary and fruit (but the stigma of only 2 lips or lobes), containing flat but thick-coated wingless seeds.

5. SESAMUM. Calyx 5-parted, short. Corolla tubular bell-shaped, 5-lobed; the 2 lobes of the upper lip shorter than the others. Stamens 4. Fruit an oblong obtusely 4-sided pod, 2-valved. Flowers solitary in the axils of the leaves, almost sessile.
6. MARTYNIA. Calyx 5-toothed, often cleft down one side. Flowers large, in terminal corymb or raceme.

1. ECCREMOCÁRPUS. (Name, from the Greek, means *hanging fruit.*)

E. scàber, or CALÁMPELIS SCABER, from Chili, cult. in gardens and conservatories; tender, climbs by branched tendrils at the end of the twice pinnate leaves; leaflets roughish or smoothish, thin, ovate or heart-shaped; flowers in loose drooping racemes; corolla inflated-clubshaped and gibbous, orange-red, about 1′ long.

2. BIGNÒNIA. (Named for the French *Abbé Bignon.*) Our only true native BIGNONIA is

B. capreolàta. Climbing trees from S. Virg. to Ill. and S.; smooth, the leaves evergreen at the south, with a short petiole and often what seems like a pair of stipules in the axil, a single pair of lance-oblong leaflets heart-shaped at base, and a branched tendril between them; flowers several in the axils, the corolla 2′ long, orange-red outside, yellow within, in spring.

3. TÉCOMA, TRUMPET-FLOWER. (Mexican name abridged.) Formerly under BIGNONIA, which name the species still bear in cultivation. Fl. late summer.

T. radìcans, WILD T. or TRUMPET-CREEPER. Wild from Penn. and Ill. S., planted farther N.; climbing freely by rootlets; leaves of 5–11 ovate or lance-ovate taper-pointed and toothed leaflets; flowers corymbed; orange-yellow and scarlet corolla funnel-shaped.

T. grandiflòra, GREAT-FLOWERED T. Cult. from Japan and China, not quite hardy N., climbing little, with narrower leaflets, and 5-cleft calyx nearly equalling the tube of the corolla, which is bell-shaped, 3′ long and broad, much wider than in the foregoing.

T. Capénsis, CAPE T. of conservatories, has smaller and rounder leaflets, naked-peduncled cluster of flowers, long-tubular and curving orange-colored corolla 2′ long, and stamens protruded.

T. jasminoìdes. A fine greenhouse species, from Australia, twining, very smooth, with lance-ovate entire bright green leaflets, and white corolla pink-purple in the throat.

4. CATÁLPA, or INDIAN BEAN. (Aboriginal name; the popular name alludes to the shape of the pods.)

C. bignonioìdes, COMMON CATALPA. Tree wild S. W., and widely planted; with large heart-shaped pointed leaves downy beneath, open panicles (in summer) of white flowers (1′ long) variegated and dotted within with some yellow and purple, and pods 1° long.

C. Kæmpferi, of Japan, beginning to be planted, has smooth leaves, many of them 3-lobed or angled, and flowers one half smaller.

5. SÉSAMUM, SESAME. (The Greek name, from the Arabic.) ①

S. Índicum, from India and Egypt, somewhat cult. or running wild in waste places far S.; rather pubescent, with oblong or lanceolate leaves, the lower often 3-lobed or parted, pale rose or white corolla 1′ long, and sweet oily seeds, used in the East for food, oil, &c.

6. MARTÝNIA, UNICORN-PLANT. (Named by Linnæus for *Prof. Martyn.*) Clammy-pubescent and heavy-scented rank herbs, with long-petioled rounded and obliquely heart-shaped wavy-margined leaves, and large flowers, in summer. ①

M. proboscídea, COMMON U. Wild S. W., and cult. in gardens; coarse, with nearly entire leaves, large corolla whitish with some purple and yellow spots, and long-beaked fruit.

M. fràgrans, SWEET-SCENTED U. Cult. from Mexico; less coarse and clammy, with somewhat 3-lobed or sinuate-toothed leaves, and showy violet-purple vanilla-scented flowers.

74. GESNERIACEÆ, GESNERIA FAMILY.

Tropical plants, with 2-lipped or somewhat irregular corollas, didynamous stamens, a one-celled ovary with two parietal many-seeded placentæ, — therefore botanically like the next family; but with green herbage, and not parasitic, and the common cultivated species have the tube of the calyx coherent at least with the base of the ovary. Many, and some very showy, plants of this order are in choice conservatories; the commonest are the following.

Gloxínia speciòsa. An almost stemless herb, with ovate and crenately toothed leaves and 1-flowered scape-like peduncles; the deflexed corolla 2′ long, ventricose, between bell-shaped and funnel-form, gibbous, with a short and spreading somewhat unequal 5-lobed border, violet with a deeper-colored throat, in one variety white. 2/

Gesnèria zebrina. Stem tall, leafy; leaves petioled, cordate, velvety, purple-mottled; a terminal raceme of showy flowers nodding on erect pedicels; corolla tubular-ventricose, with a small 5-lobed and somewhat 2-lipped border, glandular, scarlet, with the under side and inside yellow and dark-spotted. — There are several other species. 2/

Achimènes longiflòra. Stem leafy; flowers in the axils of oblong or ovate hairy leaves, which they exceed; tube of the obliquely salver-shaped corolla over an inch long, narrow, the very flat 5-lobed limb 2′ or more broad, violet-colored above, — also a white variety. Propagates by scaly bulblets from the root. 2/

75. OROBANCHACEÆ, BROOM-RAPE FAMILY.

Low, root-parasitic perennials, destitute of green herbage, and with yellowish or brownish scales in place of leaves, the monopetalous corolla more or less 2-lipped or irregular, 4 didynamous stamens, and one-celled ovary and pod with the 2 or 4 parietal placentæ covered with innumerable small seeds. Ours occur in woods, and mostly parasitic on the roots of trees.

1. EPIPHEGUS. Stems slender and bushy-branching, with small and scattered scales and two sorts of flowers, scattered in loose spikes or racemes, with minute bracts. Upper flowers conspicuous, but seldom ripening fruit, with tubular 4-toothed corolla, and long filaments and style; lower flowers small and short, seldom opening, but fertilized in the bud.
2. CONOPHOLIS. Stems thick, covered with firm overlapping scales, each of the upper ones with a flower in its axil, forming a spike. Calyx 4 - 5-toothed, and split down on the lower side. Corolla short, strongly 2-lipped; upper lip arched and notched; lower one spreading and 3-cleft. Stamens protruding.
3. APHYLLON. Stems are chiefly slender 1-flowered scapes from a scaly mostly subterranean base. Calyx 5-cleft. Corolla with a long curved tube, and a spreading slightly 2-lipped or irregular 5-lobed border; the lobes all nearly alike. Stamens included in the tube.

1. EPIPHÈGUS, BEECH-DROPS, CANCER-ROOT. (Name in Greek means *on the Beech:* the plant chiefly found parasitic on the roots of that tree.) One species,

E. Virginiàna. Common, about 1° high, with purplish flowers $\frac{1}{2}'$ or more long, in late summer and autumn.

2. CONÓPHOLIS, SQUAW-ROOT, CANCER-ROOT. (The name is Greek for *cone-scale,* the plant having the aspect of a slender fir-cone when old.) One species.

C. Americàna. Not widely common, in oak woods, forming clusters among fallen leaves, $3' - 6'$ long, as thick as the thumb, yellowish: fl. early summer.

3. APHÝLLON, NAKED BROOM-RAPE or ONE-FLOWERED CANCER-ROOT. (Name in Greek means *without leaves.*) Fl. spring and early summer.

A. uniflòrum. Open woods or thickets: slightly clammy-pubescent, with 1 – 3 scapes ($3' - 5'$ high) from a subterranean scaly base, and lance-awl-shaped calyx-lobes half the length of the violet-purplish corolla.

A. fasciculàtum, the other species, occurs only from Northern Michigan W.; has scapes from a scaly base rising out of the ground, and short triangular calyx-lobes.

76. SCROPHULARIACEÆ, FIGWORT FAMILY.

Known on the whole by the 2-lipped or at least more or less irregular monopetalous corolla, 2 or 4 didynamous stamens, single style, entire or 2-lobed stigma, and 2-celled ovary and pod containing several or many seeds on the placentæ in the axis; these with a small embryo in copious albumen. But some are few-seeded, a few have the corolla almost regular, and one or two have 5 stamens, either complete or incomplete. A large family, chiefly herbs, some shrubby, and one species is a small tree.

§ 1. *Intermediate between this family and the Nightshade Family; the flowers terminal or lateral, never really from the axils of the leaves or bracts; the corolla hardly if at all sensibly 2-lipped, sometimes almost regular, the lobes plaited in the bud: stigma enlarged, often 2-lipped. All garden exotics.*

* *With 4 stamens only, included within the narrow throat of the salver-shaped corolla: leaves alternate and entire.*

1. BRUNFELSIA. Shrubs, with glossy oblong leaves. Corolla with 5 rounded and about equal lobes, two of them, however, a little more united. Anthers all alike. Fruit fleshy.
2. BROWALLIA. Herbs, mostly a little pubescent and clammy. Corolla with somewhat unequally 5-lobed border, the lobes with a broad notch. Two of the anthers shorter and only 1-celled. Fruit a dry pod.

* * *With 4 anther-bearing stamens and a sterile filament: corolla with wide throat.*

3. SALPIGLOSSIS. Herbs, with cut-toothed or pinnatifid alternate leaves. Corolla funnel-form, with very open throat, a little oblique or irregular, the lobes all with a deep notch at the end. Pod oblong.

§ 2. *Corolla imbricated and not plaited in the bud; the smaller lip 3-parted; the larger 5-cleft, and the lobes again 2-cleft or deeply notched. Flowers terminal, panicled.*

4. SCHIZANTHUS. Calyx 5-parted, the divisions narrow. Corolla with tube shorter than the divisions, which appear as if cut up, the middle lobe of the smaller lip, towards which the stamens and style are inclined, more or less hooded or sac-like. Stamens with good anthers 2, the 2 or 3 others small and abortive. Stigma minute. Leaves alternate, pinnate, or pinnately cut.

§ 3. *Corolla with lobes imbricated and not plaited in the bud, either 2-lipped or more or less irregular, the divisions or lobes at most 5. Peduncles from the axil of leaves or bracts, no flower ever really terminating the main stem or branches.*

* *Tree, with large and opposite Catalpa-like leaves.*

5. PAULOWNIA. Calyx very downy, deeply 5-cleft. Corolla decurved, with a cylindrical or funnel-form tube, and an enlarged oblique border of 5 rounded lobes. Stamens 4, included. Pod turgid, thick, filled with very numerous winged seeds.

* * *Herbs, or a few becoming low shrubs.*

+ *With 5 anther-bearing stamens and a wheel-shaped or barely concave corolla.*

6. VERBASCUM. Flowers in a long terminal raceme or spike. Calyx 5-parted. Corolla with 5 broad and rounded only slightly unequal divisions. All the filaments or 3 of them woolly. Style expanding and flat at apex. Pod globular, many-seeded. Leaves alternate.

+ + *With only 2 or 4 anther-bearing stamens.*

++ *Corolla wheel-shaped, or at least with wide spreading border mostly much longer than the short tube: flowers single in the axils of the leaves or collected in a raceme or spike.*

7. CELSIA. Like Verbascum, but with only 4 stamens, those of 2 sorts.
8. ALONSOA. Calyx 5-parted. Corolla very unequal, turned upside down by the twisting of the pedicel, so that the much larger lower lobe appears to be the upper and the two short upper lobes the lower. Stamens 4. Pod many-seeded. Lower leaves opposite or in threes.
9. VERONICA. Calyx 4-parted, rarely 3–5-parted. Corolla wheel-shaped, or sometimes salver-shaped, with 4 or rarely 5 rounded lobes, one or two of them usually rather smaller. Stamens 2, with long slender filaments. Pod flat or flattish, 2–many-seeded. At least the lower leaves opposite or sometimes whorled.

++ ++ *Corolla salver-shaped, with almost regular 4–5-lobed border: flowers in a terminal spike. Here one species of No. 9 would be sought.*

10. BUCHNERA. Calyx tubular, 5-toothed. Corolla with a slender tube, and the border cleft into 5 roundish divisions. Anthers 4 in 2 pairs, one-celled. Style club-shaped at the apex. Pod many-seeded. Leaves mainly opposite, roughish.

++ ++ ++ *Corolla either obviously 2-lipped, or funnel-form, tubular, or bell-shaped.*

= *Corolla 2-parted nearly to the base, the 2 lips sac-shaped or the lower larger one slipper-shaped: stamens only 2 (or very rarely 3), and no rudiments of more.*

11. CALCEOLARIA. Calyx 4-parted. The two sac-shaped or slipper-shaped divisions of the corolla entire or nearly so. Pod many-seeded. Leaves chiefly opposite, and flowers in cymes or clusters.

= = *Corolla almost 2-parted, the middle lobe of the lower lip folded together to form a flat pocket which encloses the 4 stamens and the style.*

12. COLLINSIA. Calyx deeply 5-cleft. Corolla turned down; its short tube laterally flattened, strongly bulging on the upper side: upper lip 2-cleft and turned back; the lower one larger and 3-lobed, its middle and laterally flattened pocket-shaped lobe covered above by the two lateral ones. A little rudiment of the fifth stamen present. Pod globular, with few or several seeds. Flowers on pedicels single or mostly clustered in the axils of the upper opposite (rarely whorled) leaves, which are gradually reduced to bracts, forming an interrupted raceme.

= = = *Corolla not 2-parted nor salver-shaped, but with a tube of some length in proportion to the 2-lipped or more or less irregular (rarely nearly regular) 4–5-lobed border, and*

a. *With a spur or sac-like projection at the base on the lower side, and a projecting palate to the lower lip, which commonly closes the throat or nearly so: stamens 4, and no obvious rudiment.*

13. LINARIA. Calyx 5-parted. Corolla personate, and with a spur at base. (Lessons, p. 90, fig. 258.) Pod many-seeded, opening by a hole or chink which forms below the summit of each cell.
14. ANTIRRHINUM. No spur, but a sac or gibbosity at the base of the personate corolla (Lessons, p. 90, fig. 257): otherwise like 13.

b. *Neither spur nor sac at base of the corolla, nor a projecting palate in the throat, nor with the upper lip laterally compressed or folded and narrow and arched.*

1. *Stamens with anthers* 4, *and no rudiment of the fifth: peduncles* 1-*flowered.*

15. MAURANDIA, including LOPHOSPERMUM. Herbs with alternate or partly opposite leaves, and solitary long-peduncled flowers in their axils, climbing by their coiling leafstalks and flowerstalks. Calyx 5-parted, foliaceous. Corolla open-mouthed, between bell-shaped and inflated-tubular, with 2 plaits or hairy lines running down the tube within, the border obscurely 2-lipped or oblique, but the 5 spreading roundish lobes nearly similar, the upper ones outermost in the bud. Pod as in 14.

16. DIGITALIS. Herbs with erect simple stem, alternate leaves, and a simple terminal raceme of hanging flowers. Calyx 5-parted, foliaceous, the upper sepal smallest. Corolla declining, with a long more or less inflated tube and a short scarcely spreading border, distinctly or indistinctly lobed, the lower lobe or side longest, the lateral ones outermost in the bud. Pod 2-valved, many-seeded.

17. GERARDIA. Herbs with branching stems, opposite or some alternate leaves, and above with single flowers in their axils or those of the bracts. Calyx 5-toothed or 5-cleft. Corolla inflated bell-shaped or tubular-funnel form, with an oblique or rather unequal border, the 5 lobes somewhat equal, the lower and lateral ones outside in the bud. Two pairs of stamens of quite unequal length. (Lessons, p. 92, fig. 263.) Pod globular or ovate, pointed, 2-valved, many-seeded.

18. SEYMERIA. Herbs, like 17; but corolla with a short and broad bell-shaped tube, not longer than the 5 ovate or oblong nearly equal spreading lobes; and the stamens almost equal, their anthers blunt at base.

19. MIMULUS. Herbs, with opposite leaves, and single flowers in the axils of the upper ones. Calyx prismatic, with 5 projecting angles, 5-toothed. Corolla tubular or funnel-form, 2-lipped, the upper lip of 2 rounded and recurved lobes, the lower of 3 rounded spreading lobes. Stamens included. Stigma of 2 flat lips. Pod 2-valved, many-seeded.

20. TORENIA. Trailing herbs, with opposite leaves and axillary flowers. Calyx prismatic, with sharp angles, 2-lipped at summit, the lips 2-toothed and 3-toothed. Corolla short-funnel-shaped or tubular with inflated throat, 4-lobed, the upper lobe (sometimes slightly notched) outermost in the bud. Filaments arched and their anthers brought together in pairs under the upper lobe, the longer pair almost equalling the upper lobe and bearing a short naked branch or appendage at base; the shorter pair simple and included. Stigma 2-lipped. Pod many-seeded.

2. *Stamens with good anthers only* 2, *a pair of sterile ones or abortive filaments generally present also: flowers small: calyx* 5-*parted: corolla* 2-*lipped: leaves opposite, with single flowers in the axil of the upper ones: peduncles simple and bractless.*

21. ILYSANTHES. Spreading little herbs. Upper lip of the short corolla erect and 2-lobed: the lower larger, spreading, 3-cleft. Upper pair of stamens with good anthers, included in the tube of the corolla; lower pair borne in the throat and protruded, 2-forked, without anthers. Stigma 2-lipped. Pod many-seeded.

22. GRATIOLA. Low herbs. Upper lip of the corolla either entire or 2-cleft; lower 3-cleft. Stamens included; the upper pair with good anthers; the lower pair short with rudiment of anthers or a mere naked filament, or none at all. Stigma 2-lipped. Pod many-seeded. A pair of bracts at the base of the calyx.

3. *Stamens with anthers* 4, *the fifth stamen present as a barren filament or a scale: calyx* 5-*parted or of* 5 *imbricated sepals: stigma simple: leaves chiefly opposite: flowers in the axils of the upper leaves, or when these are reduced to bracts forming a terminal panicle or raceme: peduncles few-flowered, or when one-flowered bearing a pair of bractlets, from the axils of which flowers may spring: pod many-seeded.*

23. SCROPHULARIA. Homely and rank erect herbs. Corolla small, with a globular or oval tube, and a short border composed of 4 short erect lobes and one (the lower) spreading or reflexed. Fertile stamens short and included; the rudiment which answers to the fifth is a little scale at the summit of the tube of the corolla.

24. CHELONE. Low upright smooth herbs, with flowers sessile in spikes or clusters in the axils of the upper leaves, and accompanied by closely imbricated concave roundish bracts and bractlets. Corolla short-tubular and inflated, concave underneath, with the 2 broad lips only slightly open; the upper arched, keeled in the middle, notched at the apex; the lower one woolly bearded in the throat and 3-lobed at the end. Filaments and anthers woolly: sterile filament shorter than the others. Seeds winged.
25. PENTSTEMON. Herbs (or a few shrubby at base), with mostly upright stems branching only from the base, and panicled or almost racemed flowers. Corolla tubular, bell-shaped, funnel-form, &c., more or less 2-lipped, open-mouthed. Sterile filament conspicuous, usually about as long as the anther-bearing ones. Seeds wingless.
26. RUSSELLIA. Rather shrubby spreading plants, or with pendulous angular branches; the flowers loosely panicled or racemed. Corolla tubular with 5 short spreading lobes, the 2 upper a little more united. Sterile filament small and inconspicuous near the base of the corolla. Seeds wingless.

c. *Neither spur nor sac at base of the corolla, the narrow laterally compressed or infolded upper lip of which is helmet-shaped or arched, entire or minutely notched, and enclosing the 4 stamens; no sterile filament. Often showy but uncultivable plants.*

27. CASTILLEIA. Herbs with simple stems, alternate leaves, some of the upper, with flowers chiefly sessile in their axils, colored like petals, and more gay than the corollas. Calyx tubular, flattened laterally, 2–4-cleft. Corolla tubular, with a long and narrow conduplicate erect upper lip, and a very short 3-lobed lower lip. Cells of the anther unequal. Pod many-seeded.
28. PEDICULARIS. Herbs with simple stems, chiefly pinnatifid leaves and spiked flowers. Corolla tubular, with a strongly arched or flattened helmet-shaped upper lip, and the lower erect at base, 2-crested above and 3-lobed. Seeds several in each cell.
29. MELAMPYRUM. Low herbs with branching stems, opposite leaves, and flowers in their axils, or the upper crowded in a bracted spike. Calyx bell-shaped, 4-cleft, the lobes taper-pointed. Corolla tubular, enlarging above, with the lower lip nearly equalling the narrow upper one and its biconvex palate appressed to it, 3-lobed at the summit. Cells of the anther minutely pointed at base. Pod oblique, with only 2 seeds in each cell.

1. BRUNFÉLSIA. (Named for the old herbalist, *Otto Brunfels.*) Conservatory shrubs, from Brazil, cult. under the name of FRANCÍSCEA; with showy flowers, blue or violet turning paler.

B. latifòlia, is very smooth, with oval or oblong leaves, and few flowers at the end of the branches $1\frac{1}{2}'$ across.

B. Hopeàna, with lance-oblong leaves 2′ long, and flower only 1′ wide.

2. BROWÁLLIA. (Named for *Dr. Browall*, of Sweden, first a friend, later a bitter opponent of Linnæus.)

B. demíssa (named also B. ELÀTA when the plant and the man it was named for grew exalted), from S. America; cult. in the gardens, 1°–2° high, bushy-branched, with ovate leaves and handsome bright violet-blue flowers (1′ or less across, at length as it were racemed) produced all summer. ⊙

3. SALPIGLÓSSIS. (Greek for *trumpet-tongue*, from the curved apex of the style with dilated stigma likened to the end of a trumpet.

1. S. sinuàta. Cult. from Chili as an ornamental annual or biennial, under various names and varieties according to the color of the large flowers, dark-purple, or straw-colored and mostly striped: fl. all summer. In appearance resembles a Petunia.

4. SCHIZÁNTHUS. (Greek for *cut flower*, the corolla being as if cut into slips.) Cult. for ornament, from Chili: fl. summer. ⊙

S. pinnàtus, the common species, of several varieties; slender, 1°–2° high, pubescent with fine glandular hairs, with leaves once or twice pinnate or parted into narrow divisions, and numerous handsome flowers barely 1′ in diameter,

usually pink and white variegated with yellowish and some deeper purple spots on the larger lobe. — There are one or two larger flowered but less common species.

5. PAULÓWNIA. (Named for a Russian Princess.) Only one species.

P. imperiàlis, of Japan, cult. for ornament, scarcely hardy far N.; the heart-shaped very ample leaves resembling those of Catalpa but much more downy, flowers in large terminal panicle, in spring, the violet corolla $1\frac{1}{2}'-2'$ long.

6. VERBÁSCUM, MULLEIN. (Ancient Latin name.) Natives of the Old World, here weeds, often hybridizing: fl. summer. ♃ ②

V. Thápsus, COMMON M. Fields: densely woolly, the tall simple stem winged from the bases of the oblong leaves, bearing a long dense spike of yellow (rarely white) flowers.

V. Lychnìtis, WHITE M. Waste places, rather scarce: whitened with thin powdery woolliness, the stem not winged, ovate leaves greenish above, and spikes of yellow or rarely white flowers panicled.

V. Blattària, MOTH M. Roadsides: green and smoothish, 2° – 3° high, slender, with ovate toothed or sometimes cut leaves, and loose raceme of yellow or else white and purplish-tinged flowers.

7. CÉLSIA. (Named for *O. Celsius,* a Swedish Orientalist.) Fl. summer.

C. Crètica, cult. for ornament from the Mediterranean region: 2° – 3° high, rather hairy, or the raceme clammy, with lower leaves pinnatifid, upper toothed and clasping at base, corolla orange-yellow with some purple (1′ – 2′ across), lower pair of filaments naked, the upper pair short and woolly-bearded. ②

8. ALONSÒA. (Named for *Alonzo Zanoni,* a Spanish botanist.) Cult. as annuals, from South America: fl. all summer.

A. incisæfòlia (also called URTICÆFÒLIA): smoothish, branching, 1° – 2° high, with lance-ovate or oblong sharply cut-toothed leaves, and orange-scarlet corolla less than 1′ wide: several varieties.

9. VERÓNICA, SPEEDWELL. (Name of doubtful derivation, perhaps referring to *St. Veronica.*) Fl. summer.

§ 1. *Shrubby, tender, very leafy species, from New Zealand, with entire and glossy smooth and nearly sessile evergreen leaves, all opposite, dense many-flowered racemes from the axils, and acutish pods.*

V. speciòsa, is smooth throughout, with obovate or oblong blunt or retuse thick leaves, and very dense spike-like racemes of violet-purple flowers.

V. salicifòlia, has lanceolate acute leaves, and longer clammy-pubescent racemes of blue flowers.

V. Lindleyana, has oblong-lanceolate pale leaves, and racemes of pale lilac flowers.

§ 2. *Herbs, growing wild, or those of the first subdivision cultivated in gardens.*

* *Spikes or dense spike-like racemes terminating the erect stem or branches and often clustered.* ♃

V. spicàta, and sometimes V. PANICULÀTA, or hybrids between them, are cult. for ornament, from Eu.: 9′ – 2° high, with opposite lanceolate toothed leaves, lobes of mostly blue corolla much longer than the distinct tube, and pod notched at the end.

V. Virgínica, CULVER'S ROOT. Wild in rich woods from Vermont W. & S.; remarkable for the tube of the small whitish corolla longer than the acutish lobes and much longer than the calyx; simple stems 2° – 6° high, bearing whorls of lanceolate or lance-ovate pointed finely serrate leaves; spikes dense and clustered.

* * *Racemes in the axils of the opposite leaves; stems creeping or procumbent at base, but above ascending: corolla, as in all the following, strictly wheel-shaped.* ♃

+– WATER SPEEDWELLS or BROOKLIME, *in water or wet ground, smooth and with pale blue (sometimes darker striped) flowers on slender spreading pedicels.*

V. Anagállis. In water N.: leaves lance-ovate acute, sessile by a heart-shaped base, 2′–3′ long; pod slightly notched, many-seeded.

V. Americàna. In brooks, much more common; leaves mostly petioled, ovate or oblong, serrate; flowers on more slender pedicels; and pod more turgid than in the foregoing.

V. scutellàta. In bogs N.; slender, with linear slightly toothed sessile leaves, only 1 or 2 very slender zigzag racemes, few long-pedicelled pale flowers; and very flat pod deeply notched at both ends, broader than long, few-seeded.

+– +– *In dry ground, pubescent, with light blue flowers in spike-like racemes.*

V. officinàlis, COMMON SPEEDWELL. Spreading or creeping, low; leaves wedge-oblong or obovate, serrate, short-petioled; pedicels shorter than calyx; pod wedge-obcordate, several-seeded.

* * * *Raceme loose, terminating the leafy low stem or branches, or the small flowers in the axils of the gradually decreasing leaves.*

V. serpyllifòlia, THYME-LEAVED S. Creeping or spreading on the ground; with simple flowering stems ascending 2′–4′, smooth; leaves roundish, small, almost entire; corolla pale blue or whitish with darker stripes, longer than the calyx. ♃

V. peregrìna, NECKWEED or PURSLANE-S. Common weed in damp waste or cult. ground; smooth, erect, branching, with lower leaves oval or oblong and toothed, the upper oblong-linear and entire, inconspicuous flowers almost sessile in their axils, whitish corolla shorter than the calyx, and many-seeded pod slightly notched. ①

V. arvénsis, CORN S. Introduced into waste and cult. grounds E.; hairy, 3′–8′ high, with lower leaves ovate and crenate, on petioles, the upper sessile lanceolate and entire, blue flowers short-peduncled, and pod obcordate. ①

10. BÚCHNERA, BLUE-HEARTS. (Named for one *Buchner*, an early German botanist.) Flowers summer. ♃

B. Americàna. Sandy or gravelly plains, from New York W. & S., rough-hairy, turning blackish in drying; with slender stem 1°–2½° high, veiny leaves coarsely few-toothed, the lowest obovate, middle ones oblong, uppermost lance-linear, flowers scattered in the slender spike, and corolla deep purple.

11. CALCEOLÀRIA. (From Latin *calceolus*, a shoe or slipper.) Tender South American herbs or shrubs, with curious and handsome flowers, cult. as house and bedding plants. The common cultivated species are now for the most part too much mixed and crossed for botanical analysis.

C. integrifòlia (also called RUGÒSA and SALVIÆFÒLIA) is the commonest woody-stemmed species, with oblong leaves rugose in the manner of Garden Sage, and small yellow or orange flowers in crowded clusters.

C. corymbòsa, herbaceous, hairy or clammy-pubescent, with ovate crenate-toothed leaves nearly all at the root, and loose corymbs or cymes of yellow flowers, the purple-spotted mouth considerably open.

C. crenatiflòra, a fertile parent of many of the more showy herbaceous garden forms, with more leafy stems and larger flowers, their orifice rounder and smaller, the hanging lower lip or sac 1′ or more long, more obovate and flat, somewhat 3-lobed as it were towards the end, and variously spotted with purple, brown, or crimson.

C. scabiosæfòlia is a delicate annual, with pinnately divided slightly hairy leaves, on petioles dilated and connate at base, and loose small pale yellow flowers with globular lower lip about ½′ wide.

12. COLLÍNSIA. (Named by Nuttall for the late *Zaccheus Collins* of Philadelphia.) Flowers handsome, mostly 2-colored. ① ②

C. vérna. Wild from Western New York W.: slender, 6′ – 20′ high, with ovate or lance-ovate and toothed leaves, the upper clasping heart-shaped, and slender-peduncled flowers in early spring, lower lip blue, upper white.

C. bícolor, of California, and a handsome garden annual, is stouter, with crowded flowers as if whorled, pedicels shorter than calyx, lower lip of corolla violet, the upper pale or white, or in one variety both white.

13. LINÀRIA, TOAD-FLAX. (Name from *Linum*, Flax, from resemblance in the leaves of the commoner species.) Fl. summer.

* *Leaves narrow, sessile, and entire: stems erect: flowers racemed.*

L. Canadénsis, Wild T. Gravelly and sandy ground, with scattered linear leaves on the slender flowering stems, or oblong and in pairs or threes on prostrate shoots, and very small blue flowers. ① ②

L. vulgàris, Common T., Ramsted, Butter-and-Eggs. A showy but troublesome European weed, of fields and roadsides, 1° – 3° high, with alternate crowded linear or lanceolate pale leaves, and a dense raceme of yellow flowers (1′ long) with paler tips. ♃

L. triornithóphora. Cult. from Europe: glaucous, 2° – 3° high, with ovate-lanceolate leaves in whorls, and rather large slender-peduncled long-spurred flowers, violet and purple-striped. ♃

* * *Leaves broad, often lobed: stems and branches trailing: flowers very small, yellow and purple mixed, on long axillary peduncles: natives of Europe.*

L. Elátine. Nat. in gravelly or sandy soil: hairy, with ovate and halberd-shaped short-petioled leaves, the lower ones opposite. ①

L. Cymbalària. Cult. as a delicate little trailing ornamental plant: very smooth, pale, with rooting branches, and thickish almost kidney-shaped 3 – 5-lobed leaves on long petioles. ♃

14. ANTIRRHÌNUM, SNAPDRAGON. (Name from the Greek, compares the flower with the snout or muzzle of an animal.) Nat. and cult. from Europe: fl. summer.

§ 1. True Snapdragon, *with palate closing the mouth of the corolla, and erect or ascending stems, not climbing.*

A. màjus, Large S. of the gardens; with stems 1° – 3° high, oblong or lanceolate entire smooth leaves, and glandular-downy raceme of showy flowers, the crimson, purple, white, or variegated corolla over 1′ long. ♃

A. Oróntium, Small S. Weed in some old gardens and cult. grounds; low, slender, with linear leaves, and white or purplish axillary flowers ½′ long. ①

§ 2. Maurandia-like S., *with palate not so large, nor fully closing the mouth, and stems climbing by the coiling of their slender petioles and sometimes of the peduncles also.*

A. maurandioìdes, cult. from Texas and Mexico, as Maurándia antirrhiniflòra; smooth, with triangular-halberd-shaped leaves, or some of them heart-shaped, and showy flowers in their axils, the violet or purple corolla 1′ or more long. ♃

15. MAURÁNDIA. (Named for *Prof. Maurandy.*) Excluding the last preceding species, which has the flower of Snapdragon, and including Lophospermum, which has wing-margined seeds. Mexican climbers, with triangular and heart-shaped or halberd-shaped and obscurely lobed leaves, tender, cult. for ornament: fl. all summer.

§ 1. *Corolla naked inside, rather obviously 2-lipped.*

M. Barclayàna. Stems and leaves smooth; calyx glandular-hairy, clammy, its divisions lance-linear; corolla purple, usually dark, 2′ or more long.

M. semperflòrens, has lanceolate smooth calyx-divisions, and smaller rose-purple or violet corolla.

§ 2. LOPHOSPÉRMUM. *Corolla very obscurely 2-lipped, and with 2 bearded lines.*

M. erubéscens. Somewhat soft-pubescent, with irregularly toothed leaves, rose-colored flowers 3′ long, and ovate-oblong rather leaf-like sepals.

M. scándens, now less common and not so showy, is less pubescent, and has smaller less-inflated deeper purple corolla, and lance-oblong sepals.

16. DIGITÀLIS, FOXGLOVE. (Latin name, from shape of the corolla, likened to the finger of a glove, in the common species.)

D. purpùrea, PURPLE F., of which varieties with corolla white or pale and more or less strongly spotted corolla are common, 2′ long, the lobes rather obscure; leaves rugose, somewhat downy. Cult. from Eu.: fl. summer. ♃

17. GERÁRDIA. (Named for the herbalist, *Gerarde.*) Handsome, but uncultivable plants: fl. late summer and autumn. The following are the commonest wild species: mostly of gravelly or sandy soil.

§ 1. *Corolla purple or rose-color, somewhat bell-shaped: calyx-teeth short: anthers all alike, nearly pointless at base: leaves narrow, linear or thread-shaped, entire: loosely branching, nearly all annuals, except the first.*

G. linifòlia. Pine-barrens S.; with erect branches, and erect linear leaves about the length of the peduncles, truncate calyx, and corolla 1′ long. ♃

G. tenuifòlia. N. & S.; with opposite pedicels equalling the linear spreading leaves, broadly awl-shaped calyx-teeth, and corolla ½′ – ⅓′ long.

G. filifòlia. S.; with alternate pedicels twice the length of the rather fleshy thread-shaped or slightly club-shaped leaves; corolla ¼′ long.

G. aphýlla. S.; with short pedicels alternate along one side of the flowering branches, and minute scale-like or awl-shaped appressed leaves, minute calyx-teeth, and corolla ½′ long.

G. purpùrea. N. & S. in low ground; with stout pedicels not longer than the conspicuously 5-lobed calyx, opposite and spreading rather broad linear leaves, and corolla ¾′ – 1′ long.

G. marítima. Salt marshes N. & S., lower than the preceding, and with fleshy blunt leaves, the pedicels as long as the upper ones and as the obtusely 5-toothed calyx, and corolla ½′ – ¾′ long.

§ 2. *Corolla purple (or sometimes white): calyx deeply and unequally 5-cleft: anthers pointless, those of the shorter pair much smaller: leaves rather broad.*

G. auriculàta. Low grounds, from Penn. S. & W.; rough-hairy, with nearly simple stem, lanceolate or oblong leaves entire, or the lower with a lobe on each side of the base; flowers sessile in the upper axils; corolla 1′ long.

§ 3. *Corolla yellow and with a longer tube, the inside woolly, as are the filaments and anthers; the latter almost projecting, slender-pointed at base: calyx 5-cleft: taller herbs, with leaves or some of them pinnatifid or toothed.* ♃

* *Stems nearly simple: flowers in a leafy raceme: corolla more tubular.*

G. flàva, DOWNY FALSE FOXGLOVE. Open dry woods: 3° – 4° high, minutely soft-downy; upper leaves lanceolate or oblong and entire, lower sinuate or pinnatifid; pedicels very short; corolla 1½′ long.

G. quercifòlia, SMOOTH F. Rich woods, commoner S. & W.: 3° – 6° high, smooth and glaucous; upper leaves often entire, lower once or twice pinnatifid; pedicels as long as calyx; corolla 2′ long.

G. integrifòlia. Barrens, from Penn. S. & W.: 1° – 2° high, smooth, not glaucous; leaves lanceolate, entire; corolla 1′ long.

* * *Stems bushy-branched: calyx-lobes toothed or pinnatifid: leaves mostly cut.*

G. grandiflòra. Oak openings from Wisconsin S.: 3° – 4° high, minutely downy; leaves ovate-lanceolate, coarsely cut-toothed, the lower pinnatifid; pedicels shorter than the barely toothed calyx-lobes; corolla 2′ long.

G. pediculària. Common N. & S.: slightly pubescent, 2° – 3° high, very leafy; leaves all pinnatifid and the lobes cut-toothed; pedicels opposite and longer than the hairy serrate calyx-lobes; corolla over 1′ long.

G. pectinàta. Sandy barrens S.: more hairy than the foregoing, with finer divided leaves, alternate pedicels shorter than pinnatifid calyx-lobes; corolla broader and 1½′ long.

18. SEYMÈRIA. (Named for *Henry Seymer.*) Wild plants S. & W., very near Gerardia: flowers yellow, in summer and autumn.

S. macrophýlla, Mullein-Foxglove. Shady river-banks W.: 4° – 5° high, with large leaves, the twice or thrice pinnately divided or cut, the upper lanceolate and toothed; curved corolla woolly inside, also the filaments; style short. 2

S. pectinàta. Sandy ground S.: about 1° high, branchy, clammy-pubescent; pinnatifid leaves with oblong-linear lobes; corolla ½′ long. ①

S. tenuifòlia. Low sandy grounds S.: 2° – 4° high, with long slender branches; leaves pinnately divided into thread-shaped divisions; corolla hardly ½′ long. ①

19. MÍMULUS, MONKEY-FLOWER. (From Greek for *an ape,* from the grinning corolla.) Fl. all summer.

* *Wild in wet places, with erect square stem* 1° – 2° *high, oblong feather-veined serrate leaves, and violet-purple corolla* (1′ *or so in length*). 2

M. ríngens, the commonest, with clasping leaves, peduncles longer than the flower, and taper-pointed calyx-teeth.

M. alàtus, not rare more S., has leaves tapering into a petiole, peduncle shorter than calyx and short-toothed, and sharp wing-like angles to stem; whence the name.

* * *Cult. for ornament, chiefly in conservatories, from Western N. America.*

M. glutinòsus, shrubby conservatory plant from California, glutinous-pubescent, with oblong or lanceolate leaves, and large yellow orange or brick-red flower.

M. cardinàlis. Erect, clammy-pubescent; leaves wedge-oblong, partly clasping, several-nerved; flowers large, brick-red. 2

M. lùteus. Erect, smooth; leaves ovate or cordate-clasping, several-nerved; flowers showy, yellow, often spotted with rose or brown; of many varieties. 2

M. moschàtus, Musk-plant. Weak and diffuse, rooting, clammy-villous, smelling strong of musk; leaves ovate or oblong; flower small, pale yellow. 2

20. TORÈNIA. (Named for *O. Toren,* an obscure Swedish botanist.)

T. Asiática, cult. from India, a handsome hothouse plant, with lance-ovate serrate leaves, wing-angled calyx, and corolla over 1′ long, pale violet or purple with the tube and the end of the 3 rounded lower lobes dark violet.

21. ILYSÁNTHES, FALSE PIMPERNEL. (From Greek words for *mire* and *flower,* alluding to the station.) Fl. all summer.

I. gratioloides. Common in wet places, a smooth diffuse little plant, 4′ – 8′ high, with rounded or oblong leaves, and small purple or bluish flowers. ①

22. GRATÌOLA, HEDGE-HYSSOP. (Old name, from Latin *gratia,* grace.) Rather insignificant plants, in low or wet places: flowering all summer. ① 2

* *Sterile filaments minute or hardly any: corolla whitish, with yellowish tube.*

G. Virginiàna. Rather clammy, with lanceolate leaves and slender peduncles.

G. sphærocárpa. Chiefly S.: smooth and stouter, with lance-ovate leaves, peduncles scarcely longer than the calyx, and larger spherical pod.

* * *Sterile filaments obvious, usually tipped with a little glandular head in place of the anther: leaves short.*

G. viscòsa. Chiefly S. W.: clammy, with lance-oblong toothed leaves shorter than the peduncles, and whitish flowers.

G. aùrea. Sandy wet soil, E. & S.: nearly smooth, with rather narrow entire leaves as long as the peduncles, and golden yellow flowers.

G. pilòsa. From N. Jersey S.: very different from any of the foregoing, having rigid and simple erect stems and ovate or oblong sessile leaves, both hairy, the flowers sessile, the white corolla hardly longer than the calyx.

23. SCROPHULÀRIA, FIGWORT. (Plants a supposed remedy for *scrofula.*) These homely and insignificant plants hardly ought to have given the name to this large and important family.

S. nodòsa. Damp shady ground: smooth, with 4-sided stem 3°–4° high, ovate or oblong coarsely toothed leaves, and small lurid flowers in loose cymes, all summer. ♃

24. CHELÒNE, TURTLE-HEAD (to which the name, from the Greek, refers), SNAKE-HEAD, BALMONY.

C. glàbra, the common species, of wet places; 1°–2° high, with lanceolate or lance-oblong leaves on very short petioles, and white or pale purple corolla 1′ or more long, all summer. ♃

25. PENTSTÈMON. (Name, from the Greek, meaning 5 stamens, refers to the presence of the 5th stamen, which, however, has no anther.) Showy North American and a few Mexican plants, chiefly Western; two or three are wild E.; several are in choice cultivation, but few are yet common here. Fl. late spring and summer. ♃

* *Wild E. of the Mississippi, and sometimes cult.: flowers white, commonly tinged with some purplish or violet: leaves partly clasping, often serrate: panicle clammy, the corolla slightly so.*

P. pubéscens. Somewhat clammy-pubescent, or smoothish except the panicle, 1°–3° high, variable; stem-leaves lanceolate; flowers nodding; the plainly 2-lipped corolla (1′ long) with gradually enlarging tube concave on the lower, convex on the upper side, a sort of palate almost closing the mouth; sterile filament yellow-bearded down one side.

P. Digitàlis. N. Virginia to Ill. & S.: taller (2°–4°), smooth up to the naked panicle, with wider more entire leaves; corolla but slightly 2-lipped, open, abruptly inflated bell-shaped above from a narrow tube; sterile filament sparingly bearded on one side.

* * *Wild beyond but near the Mississippi, showy and cultivated for ornament.*

P. grandiflòrus. Plains from Falls of St. Anthony W. & S. W.: very smooth, pale and glaucous, 1°–3° high, with thick ovate leaves (1′–2′ long) closely sessile and entire, the upper ones rounded, short-pedicelled flowers racemed, lilac-purple oblong-bell-shaped corolla 1½′–2′ long and almost equally 5-lobed, the sterile filament nearly smooth.

P. Cobæa. Plains from Nebraska S.: 1°–2° high, stout, with ovate often denticulate thick leaves, a slightly clammy few-flowered panicle or raceme, pale purplish or whitish corolla about 2′ long and abruptly much inflated above the narrow base, the border 2-lipped, but the oblong lobes similar; the sterile filament bearded.

P. glàber. Plains from Nebraska and Missouri W.: very smooth, commonly pale or glaucous, with ascending stems 1°–2° long, lanceolate or lance-ovate entire leaves, and a narrow panicle of very handsome flowers; the tubular-inflated corolla about 1½′ long, bright purple blue, with the spreading lobes of the 2 short lips similar; sterile filaments and also the anthers slightly hairy or else naked.

* * * *Farther Western species, cultivated and hardy in the gardens.*

P. ovàtus, of Oregon, is an early blue-flowered species, smoothish, with ovate or lance-ovate serrate leaves, and open panicle of small flowers.

P. barbàtus, supposed to come from Mexico, long cult. in the gardens; smooth, with slender wand-like stems 3° – 4° high, lanceolate and entire pale leaves, long and loose raceme or panicle of drooping flowers, narrow tubular scarlet corolla over 1′ long, with erect upper lip concave and slightly 2-lobed, the lower parted into 3 reflexed or spreading oblong lobes, some beard in the throat, and sterile filament naked. Var. TORREYI, from New Mexico and Rocky Mountains, is taller, the brighter red corolla with little or no beard in the throat.

* * * * *Common garden species from Mexico, but not hardy N., are forms of*

P. Hartwègi. Smooth: leaves lanceolate, entire, the upper broader at the base and clasping; peduncles elongated, 3-flowered; corolla 2′ long, deep red or red purple, the border almost equally 5-cleft; sterile filament naked.

P. campanulàtus. Smooth: leaves lanceolate, acuminate, sharply serrate, the base clasping; flowers in a raceme-like one-sided panicle; corolla ventricose above, reddish-purple or rose-colored; sterile filament bearded. Varies greatly in cultivation.

26. RUSSÉLLIA. (Named for *Dr. Alexander Russell* of Scotland.) ♃

R. júncea, of Mexico, a showy house and bedding plant; very smooth, with small lance-ovate or linear, or else reduced to little scales on the copious long and rush-like green hanging branches and branchlets; corolla 1′ long, narrow, bright carmine red.

27. CASTILLÈIA, PAINTED-CUP. (Named for *Castillejo,* a Spanish botanist.) There are several showy species on the plains from beyond the Mississippi to the Pacific. Fl. all late spring and summer.

C. coccínea, SCARLET P. Sandy low grounds; pubescent, simple-stemmed, 1° – 2° high, with stem leaves cut-lobed, those next the flowers 3-cleft, their dilated and cut-toothed lobes brilliant scarlet, while the 2-cleft calyx is yellowish and the narrow corolla pale yellow. ① ②

28. PEDICULÀRIS, LOUSEWORT (which the name denotes). ♃

P. Canadénsis, COMMON P. or WOOD-BETONY. Low, rather hairy, with alternate leaves, the upper pinnatifid, lower pinnate, a short dense spike of greenish and purplish flowers, oblique calyx without lobes but split down in front, and a dagger-shaped pod: fl. spring.

P. lanceolàta. Less common, in swamps; 1° – 3° high, smoothish, with lance-oblong leaves doubly cut-toothed, some of them opposite, a close spike of pale yellow flowers, 2-lobed leafy-crested calyx, and ovate pod: fl. late summer.

29. MELAMPŸRUM, COW-WHEAT. (The name in Greek means *black grain,* from the color of the seeds.) ①

M. Americànum, our only species, common in open woodlands; 6′ – 12′ high, with lanceolate leaves, the upper ones abrupt or truncate at base and with a few bristle-tipped teeth, the scattered flowers pale yellowish or almost white, sometimes purplish-tinged; produced all summer.

77. ACANTHACEÆ, ACANTHUS FAMILY.

Plants with opposite simple leaves, 2-lipped or otherwise irregular or even regular monopetalous corolla, 4 didynamous or else only 2 stamens, 2-celled ovary and pod, and few seeds, — distinguished from the related orders by the seeds without albumen and borne on hook-like projections of the placentæ or on a sort of cup. Chiefly a tropical family; many in choice conservatories, here omitted.

§ 1. *Twining tropical herbs (or cult. as herbs), with nearly regular 5-lobed corolla, and globular seeds supported by a cartilaginous ring or shallow cup.*

1. THUNBERGIA. Flowers enclosed when in bud by a pair of large leaf-like bractlets borne below the short cup-shaped calyx. Corolla with a mostly somewhat curved tube and an abruptly wide-spreading border of 5 rounded equal lobes, convolute in the bud. Stamens 4, included. Pod globular, tipped with a long and conspicuous flattened beak, 2–4-seeded. Peduncles axillary, 1-flowered.

§ 2. *Erect or spreading: all the following are herbs, with flat seeds borne on hook-like processes (retinacula): calyx 4–5-parted, mostly 2-bracted.*

2. ACANTHUS. Corolla of one 3-lobed lip, the upper lip wanting. Stamens 4, with one-celled ciliate anthers. Leaves pinnatifid. Flowers in a spike.
3. RUELLIA. Corolla funnel-form, with an almost equally 5-lobed spreading border, convolute in the bud. Stamens 4, included: cells of the anthers parallel. Pod narrow, contracted into a stalk-like base, above 4–12-seeded.
4. DICLIPTERA. Corolla 2-lipped, the lower lip 3-lobed, the upper 2-cleft or entire; but the flower as it were reversed so that the 3-lobed lip seems to be the upper one. Stamens 2, protruded: cells of the anther equal, but one placed below the other. Pod 2–4-seeded below the middle.
5. DIANTHERA. Corolla 2-lipped, the upper lip erect and notched; the lower 3-lobed, wrinkled or veiny towards the base, spreading. Stamens 2: cells of the anther one below the other, mostly unequal. Pod flattened above, contracted into a stalk-like base, 4-seeded above the middle.

1. THUNBÉRGIA. (Named from the Swedish botanist *Thunberg.*) Showy flowers produced all summer.

T. alàta (so named from its winged petioles) from Africa, is the one commonly cultivated (as an annual) in many varieties as to size and color of flower, buff, orange, white, &c., usually with blackish-purple eye; herbage soft-downy or hairy; leaves between heart-shaped and arrow-shaped. ♃

2. ACÁNTHUS. (Old Greek and Latin name, from the word for *spine* or *prickle.*) ♃

A. móllis, one of the classical species, from S. Eu., is occasionally cult., not hardy N.: the broad sinuately and deeply pinnatifid leaves mostly from the root, hardly at all prickly; flowers on a short scape, dull-colored.

3. RUÉLLIA. (Named for the herbalist *Ruelle.*) Ours are wild herbs, chiefly southern, with purple or blue showy flowers, mostly in clusters, produced all summer. ♃

§ 1. *Cells of the anther pointed at base: stigma only one: pod 4-seeded.*

R. oblongifòlia. Pine barrens S.: downy, 6′–12′ high from a creeping base, with nearly sessile oval leaves barely 1′ long, almost bristle-shaped sepals, but oblong bracts, and spotted purple corolla 1′ long.

§ 2. *Cells of the anther blunt: stigmas 2: pod 8–12-seeded: stems 1°–4° high.*

R. ciliòsa. Dry soil W. & S.: clothed with soft white hairs, the oval or oblong leaves nearly sessile, pale blue corolla (about 2′ long) with slender tube much longer than the inflated upper part and than the bristle-shaped sepals.

R. strèpens. Richer soil, from Penn. W. & S.: smooth or slightly downy, with obovate or oblong leaves (1′–4′ long) narrowed into a petiole, and purple-blue corolla (1′–2′ long) with tube hardly longer than the expanded portion or than the linear-lanceolate sepals.

4. DICLÍPTERA. (Greek words for *double, shut,* from the 2-valved pod.)

D. brachiàta, of low banks S. is nearly smooth, with 6-angled stem bearing many branches, thin ovate-oblong pointed leaves on slender petiole, and interrupted spike-like clusters of small purple flowers, each with a pair of conspicuous flat bracts. ♃

5. DIANTHÈRA. (From Greek for *double anther*, alluding to the two separated cells on each filament.) Fl. all summer. ♃

D. ovàta. Muddy banks of streams S.: 4′–8′ high, smooth, with lance-ovate short-petioled leaves longer than the 3–4-flowered peduncles in their axils, and small pale purple flowers.

D. Americàna. Wet borders of streams: 2° high, smooth, with long linear-lanceolate leaves, and long peduncles (4′–6′ long) bearing an oblong spike of pale purple flowers.

78. VERBENACEÆ, VERVAIN FAMILY.

Plants with opposite (or sometimes whorled) leaves, differing from the other orders with irregular monopetalous and didynamous or tetrandrous flowers by the ovary not 4-lobed and with a single ovule in each of its (1–4) cells, the fruit either fleshy or when dry at length splitting into as many 1-celled indehiscent nutlets.

Besides the following some species of CLERODENDRON are cultivated, in choice conservatories.

§ 1. *Flowers in heads, spikes, or racemes, the flowers expanding from below upwards.*

1. PHRYMA. Flowers in slender loose spikes. Calyx cylindrical, 2-lipped, the upper lip of 3 slender-pointed teeth, the lower short and 2-toothed. Corolla tubular, 2-lipped, the upper lip notched, lower larger and 3-lobed. Stamens included. Ovary 1-celled, forming a simple akene in the calyx. Herb.
2. VERBENA. Flowers in spikes or heads. Calyx tubular or prismatic, 5-ribbed and plaited. Corolla salver-form, the tube often curved, the border rather unequally 5-cleft. Stamens included: upper pair sometimes wanting the anthers. Ovary 4-celled, at maturity splitting into 4 dry akenes or nutlets. Herbs.
3. LIPPIA. Flowers in heads, spikes, or racemes. Calyx tubular, 2–5-toothed. Corolla tubular, with 5-lobed 2-lipped border, the lower 3-lobed lip larger. Stamens included. Ovary and dry fruit 2-celled, 2-seeded.
4. LANTANA. Flowers in heads or short spikes. Calyx minute, obscurely 4-toothed. Corolla with an unequal 4-cleft spreading border, the upper lobe sometimes notched. Stamens included. Ovary 2-celled, becoming berry-like, and containing 2 little stones or nutlets. Shrubs or herbs.

§ 2. *Flowers nearly regular, in cymes from the axils of the simple leaves: shrubs.*

5. CALLICARPA. Calyx 4–5-toothed, short. Corolla tubular-bell-shaped, short, 4–5-lobed. Stamens 4, protruded, nearly equal. Ovary 4-celled, in fruit berry-like, with 4 little stones.

§ 3. *Flowers irregular, in cymes or clusters in the axils of the compound digitate leaves or of the upper leaves reduced to bracts: shrubs or trees.*

6. VITEX. Calyx 5-toothed. Corolla tubular, with a spreading 2-lipped border, the lower lip 3-parted and rather larger than the 2-lobed upper lip. Stamens 4, protruded, as is the style. Ovary 4-celled, becoming berry-like in the fruit, which contains a single 4-celled stone.

1. PHRÝMA, LOPSEED. (Name of unknown meaning.) One species.

P. Leptostàchya. Copses, &c.; 2°–3° high, with coarsely-toothed ovate thin leaves, and branches terminated by the slender spikes of very small purplish flowers, in summer, the pedicels reflexed in fruit. ♃

2. VERBÈNA, VERVAIN. (Latin name of some sacred herbs.) Fl. all summer. — Genus of difficult analysis on account of numerous hybrids, both wild and in cultivation.

§ 1. VERVAINS *native to the country, or growing as wild weeds, mostly in waste or cultivated ground; the flowers insignificant, in slender spikes; no appendage at tip of the anthers. All but the last with upright stems.* ♃

V. angustifòlia, NARROW-LEAVED V. Stems 6′–18′ high; leaves nar-

row lanceolate, sessile, roughish, slightly toothed; spikes few, thickish, crowded with purple flowers.

V. stricta, Hoary V. Barrens W. & S.: whitish-hairy, 1°–2° high; leaves obovate or oblong, serrate, sessile; spikes thick and dense; flowers blue, larger than in the others.

V. hastàta, Blue V. Stem 4°–6° high; leaves lance-oblong, some of the larger with short side lobes at base, cut-serrate, petioled; spikes densely-flowered, corymbed or panicled; flowers blue.

V. urticifòlia, Nettle-leaved or White V. Stem 4°–6° high; leaves oval or oblong-ovate, coarsely serrate, petioled; spikes of small white flowers slender and loose.

V. officinàlis, European V. Nat. by roadsides, at least S. Stems 1°–3° high, branched; leaves sessile, 3-cleft and mostly pinnatifid into narrow cut-toothed lobes; small purplish flowers in very slender panicled spikes.

V. bracteòsa. From Wisconsin S.; hairy, spreading or procumbent; leaves wedge-shaped or lance-oblong, cut-pinnatifid or 3-cleft, short-petioled; small purple flowers in solitary loose spikes, the lower ones leafy-bracted.

§ 2. Verbenas *of the garden sort, with creeping or spreading stems, and dense spikes of larger or showy flowers: anthers of the longer stamens with a gland-like tip.* ♃ ①

V. Aublètia. Wild from Ill. and Carolina W. & S.: has cut-pinnatifid leaves, and a long-peduncled spike of purple flowers, minutely bearded in the throat. — This and the several following species from South Brazil, Buenos Ayres, &c., variously and greatly mixed, make up the Verbenas which adorn our gardens in summer.

V. chamædrifòlia, the original Scarlet V., with oblong-lanceolate coarsely serrate leaves, nearly all sessile, and most intense red or scarlet flowers, in a flat cluster.

V. phlogiflòra, also named Tweediàna. More upright; the leaves decidedly petioled; the flowers inclined to form an oblong spike, and crimson, varying to rose, but not to scarlet.

V. incisa, differs from the last in the pinnatifid-incised leaves, the petioled ones with a heart-shaped base; flowers in a flat cluster, rose-color or purple.

V. teucroìdes. Erect or spreading, with ovate-oblong and incised sessile leaves, and a lengthened spike of white or pale rosy flowers, sweet-scented, especially at nightfall.

V. erinoìdes, or multífida. Dwarf and much creeping, rough-hairy, with leaves pinnatifid into linear divisions, and originally with violet purple flowers, and

V. pulchélla or ténera, with equally finely cut leaves, and rather larger originally rose-violet flowers, are part parents of the smaller races.

3. LÍPPIA. (Named for *A. Lippi,* an Italian botanist.) Fl. late summer.

L. lanceolàta, Fog-fruit. A creeping weedy herb, along river-banks from Penn. S. & W., with wedge-spatulate or oblanceolate leaves serrate above the middle, and slender peduncles from the axils bearing a head of bluish small flowers.

L. citriodòra (or Aloýsia), the Lemon-scented or Sweet Verbena of the gardens; shrub from Chili, with whorls of linear-lanceolate fragrant leaves, roughish with glandular dots, and small whitish and bluish flowers in slender spikes.

4. LANTÀNA. (Origin of name obscure.) Tropical or subtropical, mostly shrubby plants, planted out in summer, when they flower freely until frost comes; stems often rough-prickly; herbage and flowers odorous, in some pleasant, others not so. The species are much mixed.

L. Cámara, from Tropical America, has flowers deep yellow, turning first to orange, then to red.

L. mixta, from Brazil, has flowers opening white, soon changing to yellow, orange, and finally to red.

L. nívea, from Brazil, has the pleasant-scented flowers white and unchanging; or, in var. MUTABILIS, changing to bluish.

L. involucràta, of West Indies, has small obovate and prominently veiny leaves, more or less downy beneath, and heads of lilac-purple flowers, involucrate by the outer bracts.

L. Sellowiàna, of Southern Brazil, is low and spreading, with wedge-oblong or ovate strongly veined leaves, long peduncles, and heads of reddish-purple flowers lengthening somewhat with age.

5. CALLICÁRPA. (From Greek for *beautiful fruit.*) Fl. early summer.

C. Americàna, FRENCH MULBERRY. Rich soil from Virginia S.: shrub 3° – 8° high, with some scurfy down, especially on the lower face of the ovate-oblong toothed leaves, and the clusters of bluish flowers; fruits violet-blue and showy.

6. VÌTEX, CHASTE-TREE. (The ancient Latin name.)

V. Agnus-cástus, CHASTE-TREE, of Mediterranean region, has 5 – 7 lanceolate entire leaflets whitened underneath, and bluish flowers in sessile clusters forming an interrupted spike at the end of the branches; hardy only S.

V. incisa, of Northern China, barely hardy in gardens N., has 5 – 7 leaflets lanceolate and cut-pinnatifid, and the clusters of bluish flowers peduncled.

79. LABIATÆ, MINT FAMILY.

Chiefly herbs, with aromatic herbage, square stems, opposite simple leaves, more or less 2-lipped corolla (whence the name of the order), either 4 didynamous or only 2 stamens, 2-lobed stigma, and at once distinguished from all the related families by the deeply 4-parted ovary (as if 4 ovaries around the base of a common style), ripening into as many seed-like nutlets, or akenes, each containing a single seed. Embryo usually filling the seed. As in all these families, there are 2 lobes belonging to the upper and 3 to the lower lip of the corolla. Flowers from the axils of the leaves or bracts, usually in cymose clusters, or running into terminal racemes or spikes.

§ 1. *Stamens 4, parallel and ascending, and projecting from a notch on the upper side of the corolla. Nutlets reticulated and pitted, obliquely fixed by the inner side near the base.*

* *Lobes of the corolla nearly equal and oblong, turned forward so that there seems to be no upper lip, the filaments conspicuously projecting from the upper side.*

1. TEUCRIUM. Calyx 5-toothed. Corolla with a deep cleft between the two upper lobes. Cells of the anther confluent.
2. TRICHOSTEMA. Calyx 5-cleft in 2 lips, oblique. Filaments very long and slender, curved, coiled up in the bud.

* * *Lobes of the corolla equally spreading: filaments slightly projecting from the notch between the 2 upper lobes.*

3. ISANTHUS. Calyx bell-shaped, equally 5-lobed, enlarging after flowering. Corolla only little longer than the calyx, bell-shaped, with 5 equal spreading lobes.

§ 2. *Stamens 4, reclining on the lower lobe of the corolla, the outer or lower pair longer: anthers 2-celled. Corolla usually turned down or declining. Nutlets smooth or smoothish, fixed by their base, as in all the following divisions.*

4. OCIMUM. Calyx deflexed in fruit, 5-toothed, the upper tooth or lobe much broadest and sometimes wing-margined. Corolla short, the upper lip as it were of 4 lobes, the lower of one entire flat or flattish declined lobe scarcely longer than the upper. Filaments separate.

5. COLEUS. Calyx as in No. 4. Corolla similar, but the lower lobe longer and concave or boat-shaped, enclosing the stamens and style: filaments monadelphous.
6. HYPTIS. Calyx with 5 less unequal or equal teeth. Corolla of 4 short similar upper lobes, and a longer abruptly deflexed saccate lower one; filaments separate.
7. LAVANDULA. Calyx not deflexed, 13–15-nerved, 5-toothed, the upper tooth mostly larger. Corolla with tube longer than the calyx, regularly 2-lipped, i. e. upper lip 2-lobed, lower 3-lobed, the lobes all equally spreading. Stamens included, but declined towards the lower lobe of the corolla.

§ 3. *Stamens* 4 (*and the lower or outer pair longest*) *or* 2, *straight and distant or diverging: anthers plainly* 2-*celled, not conniving in pairs. Lobes of the corolla flat and spreading, or the upper erect but not arched.*

* *Corolla short and rather bell-shaped, hardly if at all* 2-*lipped, the* 4 *or rarely* 5 *lobes nearly equal and all spreading.*

8. PERILLA. Calyx in flower 5-cleft, in fruit nodding and enlarging, becoming 2-lipped. Corolla 5-cleft, the lower lobe a little longer. Stamens 4, nearly equal. Style deeply 2-cleft.
9. MENTHA. Calyx equally 5-toothed. Corolla with a 4-cleft border, the upper lobe a little broader and sometimes notched at the end. Stamens 4, nearly equal, similar.
10. LYCOPUS. Calyx 4–5-toothed. Corolla with 4 about equal lobes. Stamens 2: the upper pair, if any, without anthers.

* * *Corolla evidently* 2-*lipped, but all the lobes of nearly equal length, the upper lip erect and mostly notched, the lower spreading and* 3-*cleft, the tube not bearded within: stamens with anthers only* 2.

11. CUNILA. Calyx equally 5-toothed, striate, very hairy in the throat, one half shorter than the corolla. Stamens 2, long and protruding: no rudiments of the other pair.
12. HEDEOMA. Calyx 2-lipped, gibbous on the lower side near the base, hairy in the throat. Corolla short. Stamens 2, with anthers scarcely protruded, and 2 sterile short filaments tipped with a little head in place of anther.

* * * *Corolla elongated and irregular: the lower lobe or lip much the larger, pendent, cut-toothed or fringed, the* 4 *others nearly equal and alike: tube with a bearded ring inside at the bottom of the enlarged throat: stamens* 2 *with anthers or rarely* 4.

13. COLLINSONIA. Calyx ovate, enlarging and turned down after flowering, 2-lipped, the upper lip flat and 3-toothed, the lower 2-cleft. Cells of the anther diverging.

* * * * *Corolla evidently* 2-*lipped, short, the upper lip erect or somewhat spreading and nearly entire or notched, the lower spreading or* 3-*cleft: stamens with anthers* 4.

14. HYSSOPUS. Calyx tubular, 15-nerved, equally 5-toothed, naked in the throat. Corolla with the middle lobe of the lower lip larger and 2-cleft. Stamens very long and protruding.
15. PYCNANTHEMUM. Calyx oblong or short-tubular, about 13-nerved, equally 5-toothed or somewhat 2-lipped, naked in the throat. Corolla with the lobes of the lower lip ovate and entire. Flowers crowded in heads or close cymes.
16. ORIGANUM. Calyx hairy in the throat, about 13-nerved. Lower lip of the corolla of 3 similar lobes. Flowers crowded into spike-like clusters and furnished with imbricated often colored bracts.
17. THYMUS. Calyx ovate, hairy in the throat, 13-nerved, 2-lipped; the upper lip 3-toothed and spreading, the lower cleft into 2 awl-shaped ciliate lobes. Corolla not strongly 2-lipped, the upper lip resembling the 3 lobes of the lower lip but notched at the apex. Stamens mostly protruding.
18. SATUREIA. Calyx bell-shaped, naked in the throat, 10-nerved, equally 5-toothed. Corolla with lower lip of 3 nearly equal entire lobes. Stamens somewhat ascending. Leaves narrow.

§ 4. *Stamens* 4 (*the lower or outer pair longer*), *ascending or curved and with the plainly* 2-*celled anthers approximate or conniving in pairs under the erect and flattish but not arched upper lip. Calyx more or less* 2-*lipped.*

19. CALAMINTHA. Calyx not flattened. Corolla straight, with inflated throat, and 2-lipped border, the spreading lower lip 3-parted, its middle lobe entire or slightly notched.

20. MELISSA. Calyx with 3-toothed upper lip flat. Corolla more or less curved and ascending. Filaments arching and bringing the anthers together in pairs. Otherwise as in 19.

§ 5. *Stamens only* 2, *parallel and ascending under the erect or somewhat scythe-shaped entire or barely notched upper lip of the corolla: anthers* 1-*celled, either strictly so or by confluence of the* 2 *cells end to end.*

21. SALVIA. Calyx 2-lipped, the upper lip 3-toothed or entire, the lower 2-cleft, throat not hairy. Corolla deeply 2-lipped; the lower lip spreading or hanging, 3-lobed, the middle lobe larger and sometimes notched at the end. Filament as it were compound, the proper filament short and bearing on its apex an elongated thread-like or linear body (the connective, in fact) attached by its middle, one end of which ascending under the upper lip bears a linear 1-celled anther, the other descending bears the other smaller and imperfect cell, or a mere vestige of it, or is naked. Flowers usually large or showy.

22. ROSMARINUS. Calyx and corolla nearly as in Salvia, but the lateral lobes of the lower lip of the corolla erect and somewhat contorted (as in some Sages also). Stamens resembling those of Monarda and protruded, but with a short tooth on the filament below the middle. Shrub.

23. MONARDA. Calyx tubular, elongated, many-nerved, nearly equally 5-toothed, mostly hairy in the throat. Corolla deeply 2-lipped, narrow in the throat, the oblong or linear lips about equal in length, the lower 3-lobed at the apex, its narrower middle lobe slightly notched. Stamens with long and simple filament bearing directly on its apex a linear anther. Flowers rather large, numerous in the whorled or terminal heads.

24. BLEPHILIA. Calyx short-tubular, naked in the throat, 2-lipped, the upper lip with 3 awned, the lower with 2 nearly blunt teeth. Corolla with a more expanded throat, bluish. Otherwise like Monarda, but flowers smaller.

§ 6. *Stamens* 4, *diverging or ascending: the upper or inner pair longer! Upper lip of the corolla erect or a little arching, the lower spreading.*

25. LOPHANTHUS. Calyx rather unequally 5-toothed. Upper lip of corolla slightly 2-lobed, the lower moderately spreading, its middle lobe somewhat crenate. Stamens not parallel, the lower and shorter ones more or less ascending, the upper and longer ones diverging and declining, so as to seem the lower. Tall erect herbs, with small flowers clustered in panicled spikes.

26. NEPETA. Calyx obliquely 5-toothed. Stamens parallel and ascending, and their anthers approaching in pairs under the upper lip of the corolla, their cells diverging from each other. Middle lobe of lower lip of corolla considerably largest.

27. CEDRONELLA. Flowers nearly like those of Nepeta; but the cells of the anthers parallel.

37. PHLOMIS, of the next section, might from the stamens be sought for here.

§ 7. *Stamens* 4, *the lower or outer pair longer, ascending and parallel, their anthers in pairs mostly under the concave or arched upper lip of the corolla. Plants not sweet-scented, some of them bitter-aromatic.*

* *Corolla inflated funnel-form and rather slightly* 2-*lipped: calyx thinnish, open bell-shaped in fruit, the* 5 *teeth equal and pointless: flowers simply spiked, only one to each bract or floral leaf.*

28. PHYSOSTEGIA. Upper lip of the corolla broad and a little arched, entire; lower of 3 broad and somewhat spreading short lobes. Smooth and scentless herbs, with thickish and sessile lanceolate or oblong leaves.

* * *Corolla decidedly* 2-*lipped: calyx also* 2-*lipped, irregular, closed in fruit.*

29. BRUNELLA. Calyx tubular bell-shaped, reticulated, flattened on the upper side; the upper lip broad, flat, 3-toothed; the lower 2-cleft. Tube of the corolla dilated on the lower side just below the rather narrowed throat; upper lip arched and entire; lower widely spreading, with lateral lobes oblong, the concave middle one rounded and crenulate. Filaments 2-toothed at the apex, the lower tooth bearing the anther. Flowers in a terminal close head or short spike.

30. SCUTELLARIA. Calyx short, with the very short lips truncate and entire, and a large hump on the upper side, the whole helmet-shaped; the upper lip usually falling away when the fruit is ripe. Corolla with rather long ascending tube, the lateral lobes of the lower lip small and somewhat connected with the arched upper lip, the middle lobe larger and spreading or the sides reflexed: anthers of the lower stamens 1-celled. Bitterish herbs, not aromatic, with flowers single in the axil of each bract or leaf.

* * * *Corolla decidedly 2-lipped: calyx 5-toothed, regular, or sometimes obscurely 2-lipped, not closing in fruit: the teeth commonly awl-shaped or triangular, often rigid or spiny-tipped.*

+– *Stamens included in the tube of the corolla: calyx 10-toothed.*

31. MARRUBIUM. Teeth of the calyx awl-shaped or spiney-tipped, recurved after flowering. Corolla small: upper lip erect. Bitter-aromatic plants: flowers in axillary capitate whorls.

+– +– *Stamens raised out of the tube of the corolla: calyx 5-toothed.*

++ *Anthers opening crosswise by 2 unequal valves, the smaller one ciliate.*

32. GALEOPSIS. Calyx tubular bell-shaped, 5-nerved, with spiny-tipped teeth. Corolla enlarged in the throat, the ovate and entire upper lip arched, the middle lobe of spreading lower lip obcordate. Flowers in axillary whorl-like clusters.

++ ++ *Anthers opening lengthwise in the ordinary way.*

33. LAMIUM. Calyx tubular bell-shaped, with 5 awl-shaped spreading teeth. Corolla much enlarged in the throat, the upper lip arching and with a narrow base, lateral lobes of lower lip very short, the middle one rounded and spreading or turned down, its base much narrowed. (Lessons, p. 90, fig. 256.) Stamens ascending under the upper lip. Nutlets truncate at the top.

34. LEONURUS. Calyx top-shaped, the awl-shaped teeth when old spreading and spiny-pointed. Corolla like Stachys, but middle lobe of lower lip obcordate. Stamens parallel. Nutlets truncate and sharply 3-angled. Stems erect. Flowers in close whorls in the axils of cut-lobed leaves.

35. STACHYS. Calyx mostly tubular bell-shaped, the teeth triangular or awl-shaped, sometimes rigid or even pungent. Corolla not enlarged in the throat, the upper lip entire or nearly so, the lower 3-lobed with the middle lobe nearly entire. Stamens ascending under the upper lip, but the outer pair turned down after discharging their pollen! Nutlets obtuse, but not truncate. Flowers crowded in whorls, most of these commonly approximate in a terminal raceme or spike.

36. BETONICA. Like Stachys, but calyx more tubular and with awn-like teeth, tube of corolla longer and its upper lip sometimes notched, and the stamens generally remaining parallel.

37. PHLOMIS. Calyx tubular, with rigid narrow awl-shaped teeth from the notch of as many very short and broad lobes. Corolla as in Stachys. Upper pair of stamens (rather the longer) with an awl-shaped appendage at the base of the filaments.

38. MOLUCCELLA. Calyx membranaceous and greatly enlarged, funnel-form, the border reticulated, veiny, entire, except 5 mucronate points. Corolla much shorter than the calyx; the middle lobe of its lower lip obcordate. Nutlets 3-sided.

1. TEÙCRIUM, GERMANDER. (Named for *Teucer*, king of Troy.) ♃

T. Canadénse, our only species, in low grounds, 1° – 3° high, downy, with ovate-lanceolate serrate leaves downy beneath, and pale purple or rarely white flowers collected in a long spike, in late summer.

2. TRICHOSTÈMA, BLUE CURLS. (Name from the Greek, means *hair-like stamens.*) Ours are branching loosely-flowered rather clammy low herbs, with entire leaves, and small flowers as it were panicled, blue, or changing to purple, in summer and autumn. ①

T. dichótomum, Common B. or Bastard Pennyroyal. Sandy fields E. & S.: 6′ – 12′ high, with mostly lance-oblong short-petioled leaves.

T. lineàre, from New Jersey S., has linear or lance-linear smoother leaves.

3. ISÁNTHUS, FALSE PENNYROYAL. (Name in Greek means *equal flower*, i. e. parts of corolla regular.) ①

I. cærùleus. Common in sandy or sterile soil; bushy-branched, clammy-pubescent, 6′ – 12′ high, with oblong 3-nerved entire leaves, and scattered small blue flowers on axillary peduncles: all summer.

4. ÒCIMUM, SWEET BASIL. (Greek name, referring to the odor, the herbage sweet-scented.)

O. Basílicum, SWEET BASIL. Low sweet-herb, of kitchen-gardens, from India, with ovate somewhat toothed leaves, ciliate petioles and calyx, and bluish-white racemed flowers, in summer. ①

5. CÒLEUS. (Name from the Greek word for *sheath*, alluding to the monadelphous stamens.)

C. Blùmei, of Java, especially its var. VERSCHAFFÉLTII, the showy species of ornamental grounds in summer, planted for its richly-colored ovate pointed and coarsely toothed leaves, either blotched with crimson or bronze-red, or almost wholly colored; the inconspicuous flowers blue or bluish and racemed.

6. HÝPTIS. (From a Greek word meaning *reversed.*) Fl. late summer.

H. radiàta. Low ground, North Carolina & S.: stems 2° – 4° high; leaves lance-ovate, toothed; flowers white or purple-dotted, small, crowded in peduncled whitish-involucrate heads. ♃

7. LAVÁNDULA, LAVENDER. (From Latin *lavo*, to lave, for which Lavender-water is used.)

L. vèra, GARDEN L. Cult. from S. Europe: a low undershrub, barely hardy N., hoary, with lance-linear leaves, and slender spikes of bluish small flowers on long terminal peduncles, in summer.

8. PERÍLLA. (Name unexplained.) Natives of China and Japan. ①

P. ocimoìdes, var. **crìspa,** or P. NANKINÉNSIS of the gardens: a balsamic-scented much-branched herb, cult. for its foliage, the ovate-petioled leaves in this variety dark purple or violet-tinged beneath, bronze-purple above, the margins wavy and deeply cut-toothed, the insignificant rose-colored or whitish flowers in panicled spike-like racemes, in late summer.

9. MÉNTHA, MINT. (Ancient Greek and Latin name.) One native and two very common naturalized European species, mostly spreading rapidly by running rootstocks; leaves toothed; the small flowers purplish-bluish, or almost white, in summer. ♃ The following common Mints all in wet places.

M. víridis, SPEARMINT. Nearly smooth, with oblong or lance-ovate wrinkled-veiny sessile leaves, and flowers in narrow terminal spikes.

M. piperìta, PEPPERMINT. Smooth, with ovate acute petioled leaves, and whorled clusters of flowers forming loose interrupted spikes.

M. Canadénsis, WILD MINT. Along shaded brooks; pleasant-scented, hairy or a smooth variety, with ovate or lance-oblong acute or pointed leaves on short petioles, and whorls of flowers in the axils of some of the middle pairs.

10. LÝCOPUS, WATER-HOREHOUND. (Name in Greek means *wolf's foot.*) Resembling the Wild Mint, but bitter, and not aromatic, commonly producing slender sometimes tuber-bearing runners from the base, smooth, the very small white flowers close-clustered in the axils of the leaves, in summer. Wild in shady moist soil. ♃

L. Virgínicus, BUGLEWEED. Common N.; stems blunt-angled, 6′ – 18′ high; leaves mostly lance-ovate and merely toothed; calyx-teeth 4, ovate and bluntish. Used in medicine.

L. Europæus, under several varieties: common N. & S., is taller, with sharply 4-angled stems, ovate-oblong or lanceolate leaves either toothed or pinnatifid, many flowers in the clusters or whorls, and 5 calyx-teeth rigid and sharp-pointed.

11. CUNÌLA, DITTANY. (An old Latin name of unknown meaning.)

C. Mariàna, MARYLAND D. Dry hills through the Middle States; nearly smooth, 1° high, corymbosely much branched, with ovate or heart-shaped almost sessile serrate leaves (1′ long), and peduncled loose cymes of purplish flowers, in summer. ♃

12. HEDEÒMA. (Formed from a Greek name of a sort of Mint, refers to the sweet scent.) Low and fragrant-scented, growing in dry and open or sterile grounds, with small flowers in loose axillary clusters, all summer.

H. pulegioìdes, AMERICAN PENNYROYAL, the pungent aromatic scent and taste being like that of the English Pennyroyal or Mentha Pulegium of Eu.; very common, 5′ – 8′ high, hairy, branching, with oblong-ovate petioled leaves, few flowered clusters, and bluish corolla scarcely exceeding the calyx. ①

H. hìspida, is common from Western Illinois S. W.; 2′ – 5′ high, hairy, with sessile linear entire leaves, and bristly-ciliate calyx. ①

13. COLLINSÒNIA, HORSE-BALM. (Named for *Peter Collinson* of London, who corresponded with Bartram and Linnæus.) Rather tall and large-leaved strong-scented plants: fl. summer. ♃

C. Canadénsis, also called RICH-WEED and STONE-ROOT, the only common species, in rich moist woods; smooth, 2° – 3° high, with ovate serrate leaves 3′ – 6′ long and on long petioles, and pale yellow lemon-scented flowers on slender pedicels in panicled racemes.

14. HYSSÒPUS, HYSSOP. (The ancient Greek name of the plant, from the Hebrew.) ♃

H. officinàlis, the only species, cult. in gardens from the Old World, rarely running wild: smooth tufted simple stems or branches 2° high; leaves lance-linear and entire; small clusters of blue flowers crowded in a terminal spike, in summer.

15. PYCNÁNTHEMUM, MOUNTAIN MINT or BASIL. (Name from Greek, means *dense flower-clusters.*) Several species, all aromatic-scented, 1° – 3° high, in open usually gravelly or sandy soil; flowers with pale corolla often purple-dotted, in late summer and autumn. ♃ Only the following widely common.

P. incànum. Leaves petioled, ovate or oblong, remotely toothed, finely soft-downy above and white-hoary beneath, those next the open flat cymes whitened both sides; bracts and calyx-teeth somewhat awn-pointed.

P. mùticum. Minutely soft-downy but hardly whitened, rather low, bushy-branched; leaves mostly lance-ovate and sessile, with rounded or slightly heart-shaped base, minutely sharp-toothed, rather rigid; flowers in heads or dense clusters; calyx-teeth and inner bracts rather blunt.

P. pilòsum. Only from W. Penn. W., is downy with rather long soft hairs; the broadish lanceolate leaves acute at both ends and nearly entire; whorled heads at the end of the branches; the calyx-teeth and bracts ovate-lanceolate and acute.

P. aristàtum. Only from New Jersey S., in pine-barrens: minutely soft-pubescent; leaves lance-oblong or broadly linear, rigid, almost entire; flowers in heads, with the narrow and awn-pointed bracts and calyx-teeth as long as the corolla.

P. lanceolàtum. Smoothish, not hoary, very leafy, bushy branched; leaves small and clustered, narrow lanceolate or lance-linear, rigid, sessile, obtuse at base; flowers small, in numerous globular close heads which are crowded in terminal corymbs; calyx-teeth and bracts short, triangular; lips of the corolla very short.

P. linifòlium. Like the last, less common N.: smoother, with lance linear leaves, and narrower sharp-pointed bracts and calyx-teeth.

16. ORÍGANUM, MARJORAM. (Old Greek name, said to mean *delight of mountains.*) Natives of the Old World: sweet-herbs: fl. summer. ♃

O. vulgàre, WILD MARJORAM. Old gardens, and wild on some roadsides; 1°–2° high, with small ovate nearly entire leaves, on short petioles, and purplish flowers in corymbed purple-bracted clusters or short spikes; calyx equally 5-toothed.

O. Majoràna, SWEET MARJORAM. Cult. in kitchen-gardens (as an ①); leaves small and finely soft-downy; the bracts not colored; flowers whitish or purplish, with calyx hardly toothed but cleft nearly down on the lower side.

17. THÝMUS, THYME. (Ancient Greek and Latin name.) Low or creeping slightly woody-stemmed sweet-aromatic plants of the Old World: fl. small, in summer. Leaves in the common species entire, small, from ¼′ to near ½′ long, ovate, obovate or oblong with tapering base. ♃

T. Serpýllum, CREEPING THYME. Cult. as a sweet herb, rarely a little spontaneous; creeping, forming broad flat perennial turfs; leaves green; whorls of purplish or flesh-colored flowers crowded or somewhat spiked at the ends of the flowering branches.

T. vulgàris, COMMON THYME. Rarely cult., more upright and bushy than the other, pale and rather hoary; flowers in shorter clusters.

18. SATURÈIA, SAVORY. (The ancient Latin name.) Aromatic: fl. summer.

S. horténsis, SUMMER SAVORY. Low and homely sweet herb of the gardens, sparingly run wild W., with oblong-linear leaves tapering at base, and pale or purplish small flowers clustered in their axils, or running into panicled spikes at the end of the branches. ①

19. CALAMÍNTHA, CALAMINTH. (Greek for *beautiful Mint.*) Fl. summer. ♃

§ 1. *Flowers loose in the axils, or above running into racemes or panicles.*

C. glabélla. A delicate native but uncommon species, only from Niagara Falls W.: smooth, with weak stems 5′–20′ long, also with creeping runners, oblong or almost linear leaves, or ovate on the runners, the loose purplish flowers about ⅓′ long.

C. Népeta, BASIL-THYME. Nat. from Eu. from Virginia S.: soft-downy, branching, 1°–2° high, with round-ovate crenate leaves, small and loose purple flowers, and calyx hairy in the throat.

§ 2. *Flowers in terminal heads or head-like whorls, crowded with awl-shaped bracts.*

C. Clinopòdium, BASIL. Waste grounds and along thickets; hairy, with rather simple stems 1°–2° long, ovate and nearly entire petioled leaves, and pale purple small corollas.

20. MELÍSSA, BALM, BEE-BALM. (Old name from Greek for *bee.*) Old-World sweet herbs. Fl. summer. ♃

M. officinàlis, COMMON B. Gardens, sparingly running wild; rather hairy, loosely-branched, lemon-scented, with ovate or scarcely heart-shaped crenate-toothed leaves, and yellowish or soon white flowers in small loose axillary clusters.

21. SÁLVIA, SAGE. (From the Latin *salvo,* to save, from its reputed healing qualities.)

§ 1. WILD SAGES *of the country, all with blue or partly white corollas.* ♃

* *Upper lip of calyx 3-toothed: lower cell of the anther present but deformed.*

S. lyràta. Sandy soil from New Jersey to Ill. & S.: 1°–2° high, rather hairy, with leaves mostly at the root and obovate or lyre-shaped, and a smaller pair on the stem; whorls of flowers forming an interrupted raceme; corolla hardly 1′ long.

* * *Upper lip of the calyx entire: lower cell of the anther wanting.*

S. urticifòlia. Woodlands from Maryland S.: 1°–2° high, leafy, somewhat clammy-downy; leaves rhombic-ovate; racemes slender, the blue and white corolla only ½′ long.

S. azùrea. Sandy soil S. & S. W.: nearly smooth and green, with rather simple stems, 2°–4° high; leaves lance-linear with tapering base, obtuse, entire, or the lower serrate; the showy azure-blue flowers (less than 1′ long) numerous in a spike-like raceme.

S. Pítcheri, from Kansas to Texas, is very like the foregoing, but minutely soft-downy; occasionally cultivated, as is also

S. farinòsa, of Texas, with more petioled oblong-lanceolate leaves, the spikes, calyxes, &c. white-hoary, in contrast with the light blue corolla.

§ 2. Garden Sages, *cultivated for ornament, or the first species for its savory foliage. Perennials, but some cult. as annuals, several woody at base.*

* *Flowers blue.*

S. officinàlis, Common Sage, from S. Eu.: low, minutely hoary-pubescent, with oblong-lanceolate leaves finely reticulated-rugose and the margins crenulate, spiked flower-whorls, and short corolla.

S. pàtens, from Mexico: 2°–3° high, rather hairy, with crenate triangular-ovate or halberd-shaped leaves, or the uppermost sessile ones oval, loose-pedicelled flowers, showy deep blue corolla over 2′ long, the lips widely gaping and the stamens exserted.

* * *Flowers scarlet-red.*

S. spléndens, Scarlet Sage, of Brazil: smooth, with branching stems, ovate pointed leaves, the floral ones and calyx as well as the corolla (2′ or more long and with short lower lip) bright scarlet.

S. fúlgens, Cardinal or Mexican Red S., from Mexico: tall, pubescent, with crenate ovate or oval leaves heart-shaped at base and somewhat rugose, green calyx, and long-tubed downy deep scarlet corolla over 2′ long, the style plumose.

S. coccínea, from Tropical America: somewhat downy or soft-hairy, with ovate and heart-shaped acute crenate leaves, deciduous bracts, green or purplish calyx, and smooth red corolla 1′ long, with lower lip much longer than the upper one.

S. pseudo-coccínea, from Trop. Amer.: like the last, but with bristly-hairy stems, less heart-shaped leaves, and corolla more or less pubescent.

* * * *Flowers white.*

S. argéntea, from the Mediterranean regions: cult. for its silvery-white foliage, hardy; the very large round-ovate root-leaves clothed with long white wool; flowering stem and its sessile leaves, as well as calyx, &c. clammy-hairy; the white corolla with scythe-shaped upper lip 1′ long and a very short tube.

22. ROSMARÌNUS, ROSEMARY. (Old Latin name, *dew of the sea.*)

R. officinàlis, from S. Eu.: not hardy N.: leaves evergreen, linear, entire, with revolute margins, white-hoary beneath, the upper with pale blue flowers in their axils.

23. MONÁRDA, HORSE-MINT or BALM. (Named for an early Spanish writer on the medicinal plants of the New World, *Monardez.*) Fl. summer.

§ 1. *Stamens and style protruding beyond the narrow acute upper lip of the corolla. leaves oblong-ovate or lance-ovate, with roundish or slightly heart-shaped base, veiny, pleasant-scented.*

M. dídyma, Oswego Tea or Bee-Balm. Wet ground N., and cult.; leaves petioled; the floral ones tinged with red; calyx naked in the throat; corolla bright red.

M. fistulòsa, Wild Bergamot. Rocky grounds; soft-downy or smoothish; leaves petioled, the floral ones often whitish; calyx very hairy in the throat; corolla rose-color, purple, or white.

M. Bradburiàna. From Ohio W., differs from the preceding in the sessile leaves soft-hairy beneath, calyx contracted above, and shorter corolla.

§ 2. *Stamens not longer than the purple-spotted notched upper lip of the short corolla, the tube of which is nearly enclosed in the calyx.* ① ②

M. punctàta, HORSE-MINT. Dry sandy ground, from New York to Ill. and S.: strong-scented and pungent, slightly hoary; leaves lanceolate, the floral ones and bracts tinged yellow and purple; calyx-teeth short and awnless; corolla yellowish.

M. aristàta. Plains from Missouri S. W., has its calyx strongly bearded in the throat and with awn-like teeth, the floral leaves and bracts conspicuously awn-tipped.

24. BLEPHÍLIA. (From Greek for *eyelash*, the bracts strongly ciliate, the outer ones ovate.) Fl. summer. ♃

B. ciliàta. Dry ground, from Penn. S. & W.; leaves almost sessile, ovate or oblong, whitish-downy beneath; outer bracts large, acute; corolla hairy.

B. nepetoìdes. Low shady grounds N. & W.: hairy all over; leaves lance-ovate sometimes heart-shaped at base, on distinct petioles; bracts smaller and very slender-pointed; corolla smoothish, purple-spotted.

25. LOPHÁNTHUS, GIANT HYSSOP. (Name from Greek for *crest* and *flower*, not very appropriate. Wild in rich soil, chiefly N. & W., with ovate and toothed leaves: fl. summer. ♃

L. nepetoìdes. Smooth, coarse, not sweet-scented; stem 4° – 6° high and sharply 4-angled; calyx-teeth ovate, bluntish, almost equalling the dull yellowish corolla.

L. scrophulariifòlius. Resembles the preceding, but the obtusely angled stem and sharper-toothed leaves rather pubescent, the lanceolate acute calyx-teeth shorter than the purplish corolla.

L. anisàtus. Wild from Wisconsin far N. W. and rare in cultivation: slender, with anise-scented leaves white beneath, and calyx much shorter than the lavender-blue corolla.

26. NÉPETA, CAT-MINT. (Latin name, from the city *Nepete.*) ♃

N. Catària, CATNIP. Weed nat. from Eu. around dwellings and gardens: soft-downy; with oblong heart-shaped leaves deeply crenate, and whitish flowers crowded in terminal clusters or spikes, in late summer.

N. Glechòma, GROUND IVY, GILL. Weed nat. from Eu. in waste or cult. shaded grounds: creeping and spreading, with smoothish rounded kidney-shaped crenate leaves on slender petioles, and light blue flowers in their axils, each pair of anther cells approaching and forming a little cross: fl. all spring and summer.

27. CEDRONÉLLA. (From Greek name of *oil of cedar*, alluding to the sweet aromatic scent of the foliage of the first species.) The cultivated species not hardy N.: fl. summer. ♃

C. triphýlla, BALM-OF-GILEAD of the English gardens, here rarely cult., from Madeira; very sweet-scented leaves of 3 broadly lanceolate leaflets; flowers purplish.

C. Mexicàna, from New Mexico, has simple lance-ovate leaves with heart-shaped base, erect stems, and handsome rose-colored flowers in close clusters.

C. cordàta, wild in shady grounds from W. Penn. S., but rare: low, hairy, with long leafy runners, heart-shaped leaves, and scattered flowers, the purplish corolla 1½′ long, its throat inflated.

28. PHYSOSTÈGIA, FALSE DRAGON-HEAD. (Name from Greek words for *inflated* or *bladdery covering.*) Fl. all summer. ♃

P. Virginiàna. Wet banks of streams, from New York W. & S., in several varieties: 1° – 4° high; leaves mostly serrate; flowers either crowded or rather distant in the spikes; corolla pale rose-purple, 1′ or more long.

29. BRUNÉLLA, SELF-HEAL or HEAL-ALL. (Latinized from the old German name.) Fl. all summer. 2

B. vulgàris. Low fields and copses: low, spreading, with ovate or oblong petioled leaves, and 3 flowers under each of the broad and round purplish bracts of the head; corolla bluish-purple or rarely white.

30. SCUTELLÀRIA, SKULLCAP. (Name from Latin *scutellum*, a dish.) Fl. in summer, in species ours blue or violet. 2

§ 1. *Flowers in racemes or spikes terminating the stem and branches.*

S. versícolor. River-banks, from Penn. W. & S.: stem stout, 1° – 3° high, soft-pubescent, as are the heart-shaped very veiny and rugose crenate and blunt-ish long-petioled leaves; spike-like racemes clammy-pubescent; corolla almost 1′ long, the lower lip purple-spotted.

S. canéscens. From Penn. S. & W.: stems branching, 2° – 4° high; leaves petioled, ovate or lance-ovate, or some of them heart-shaped at base, the lower surface as also the racemes and flowers whitish with very fine soft down, otherwise smoothish; corolla 1′ long.

S. pilòsa. Pubescent with spreading hairs; stem nearly simple, 1° – 3° high, bearing rather distant pairs of roundish or oblong-ovate veiny leaves, the lower sometimes heart-shaped, upper on short-margined petioles; racemes short, the bracts spatulate; corolla ¾′ long.

S. integrifòlia. Along thickets: minutely hoary, 1° – 2° high; leaves lance-oblong or linear, obtuse, nearly entire, very short-petioled; raceme short; corolla 1′ long, much enlarged upwards.

§ 2. *Flowers short-peduncled in the axils of some of the sessile leaves.*

S. nervòsa. Moist ground from New York S. W.: smooth, 1° – 2° high, slender; leaves roundish or ovate, sparingly toothed, 1′ long, those subtending the flowers ovate-lanceolate and entire, the nerve-like main veins prominent beneath; flowers ¼′ long.

S. párvula. Dry banks and shores, commoner W. & S.: low and spreading, 3′ – 6′ high; with round-ovate or lance-ovate and slightly heart-shaped leaves ½′ or more long, and flowers ¼′ long.

S. galericulàta. Wet ground N.: smoothish; the slender simple stems 1° – 2° high; leaves ovate-lanceolate, sometimes with a heart-shaped base, acute, serrate; flowers ¾′ long, with arched upper lip.

§ 3. *Flowers in axillary or some terminal one-sided racemes.*

S. lateriflòra. Wet shady places: smooth, branching, 1° – 2° high, with lance-ovate or oblong acute coarsely serrate leaves on slender petioles; racemes rather leafy-bracted; flowers ¼′ long.

31. MARRÙBIUM, HOREHOUND. (Late Latin name, from Hebrew word for bitter.) Fl. late summer. 2

M. vulgàre, COMMON H., from Europe, in gardens and waste places: branching, spreading, hoary-downy, with round-ovate crenate-rugose leaves on petioles, and small white corolla.

BLACK HOREHOUND, BALLÒTA NÌGRA, of Europe, and naturalized in a few places E., is not hoary, and has purplish flowers with a spreading 5-toothed border to the calyx.

32. GALEÓPSIS, HEMP-NETTLE. (Name in Greek means *like a weasel*; the likeness not at all obvious.) Fl. summer. ①

G. Tetràhit, COMMON H. Damp waste and cult. grounds, nat. from Eu.: a common weed, rather bristly-hairy, with stem swollen below each joint, leaves ovate and coarsely serrate, and corolla purplish or variegated.

33. LÀMIUM, DEAD-NETTLE. (Name from Greek word for *throat*.) Low spreading herbs from Old World: fl. spring and summer.

* *Insignificant weeds in waste or cultivated grounds, with few small and purple or slender flowers in some of the axils.* ① ②

L. amplexicàule. Leaves rounded, deeply crenate-toothed and cut, the upper ones clasping; corolla with a long tube, its upper lip bearded, the lower one spotted.

L. purpùreum. Not so common: leaves more heart-shaped, and less cut, all of them petioled.

* * *Flowers larger, 1′ long, in several axillary whorls: corolla ascending, the lateral lobes bearing a slender awl-shaped appendage.* ♃

L. álbum. Gardens and waste grounds: hairy; leaves all petioled, ovate and heart-shaped, rugose-veiny; flowers white.

L. maculàtum. Cult. in gardens; hairy or nearly smooth; leaves as in the other, but with a white spot or blotch on the upper face; flowers purple.

34. LEONÙRUS, MOTHERWORT. (Name in Greek means *lion's tail*, but there is no obvious resemblance.) Fl. late summer.

L. Cardìaca, Common M. Nat. from Eu. in cult. and waste grounds; tall, with palmately cleft long-petioled leaves, the lower rounded, the upper wedge-shaped at base; upper lip of pale purple corolla bearded. ♃

35. STÀCHYS, HEDGE-NETTLE. (Greek word for *spike*, from the inflorescence.) Flowers in summer, in all ours ♃.

* *Wild species in wet grounds, with small light reddish-purple corolla.*

S. palústris. Common in many and diverse varieties, rough-hairy or smooth, or the angles of the stem bristly; leaves oblong or lance-ovate, or the lower heart-shaped at base, crenately toothed, the lower or nearly all petioled; calyx-teeth sharp-pointed or pungent.

S. hyssopifòlia. Wet sandy soil, not common: smooth, low (1° high); leaves linear or linear-oblong, almost entire, sessile; calyx-teeth softer and less pointed.

* * *Cultivated for ornament: not very common.*

S. lanàta, from Europe: low, tufted; the stems, oblong Mullein-like leaves, and dense interrupted spike wholly covered with thick and silvery white wool, and very short dull purple corollas.

S. coccínea, Scarlet S., from Mexico, with ovate-oblong and heart-shaped pubescent leaves, and whorled flowers with bright red corolla, its tube often 1′ long.

36. BETÓNICA, BETONY. (The Latin name.) Cult. occasionally in old gardens, from Old World. Stems low, erect: leaves coarsely crenate, oblong, those on the stem few, of the root larger and heart-shaped on long petioles. Fl. summer. ♃

B. grandiflòra, Great B., from Northern Asia; with stem 1° – 2° high, flowers in separated whorls, purple corollas 1½′ long.

B. officinàlis, Wood B., from Europe, has flowers many times smaller, in a more crowded oblong spike.

37. PHLÒMIS, JERUSALEM SAGE. (Old Greek name of some woolly plant.) Fl. summer. ♃

P. tuberòsa, from E. Eu.: cultivated in old gardens, sparingly run wild; stems 3° – 5° high; leaves ovate or ovate-oblong and heart-shaped, crenate, rugose, smoothish; flowers in remote and dense whorls; upper lip of the purple corolla white-hairy inside.

38. MOLUCCÉLLA, MOLUCCA BALM, SHELL-FLOWER. (Name from Molucca Islands.) Fl. summer. ①

M. lævis, from Asia: in some old gardens: low, much branched, smooth, with roundish petioled leaves, flowers sessile in their axils accompanied by spine-like bracts, the remarkable large cup-shaped calyx oblique and 1′ long, much exceeding the inconspicuous corolla.

80. BORRAGINACEÆ, BORAGE FAMILY.

Mostly rough or rough-hairy plants, known from all related monopetalous orders by having a deeply 4-lobed ovary, or apparently 4 ovaries around the base of a common style, each 1-ovuled, ripening into akenes or nutlets, along with regular flowers (Echium excepted), stamens as many as the lobes of the corolla (5) and alternate with them, and alternate (mostly entire) leaves. In the Heliotrope tribe, however, the ovary is not lobed, but the fruit at maturity separates into 2 or 4 nutlets. Stigmas 1 or 2. Embryo filling the seed: no albumen. Flowers disposed to be on one side of the stem or branches, or of the branches of cymes, the raceme-like clusters coiled at the end and straightening as the flowers expand. Herbage not aromatic; juice commonly bitterish, often somewhat mucilaginous. Roots of several are red and used for dye.

I. BORAGE FAMILY PROPER, having the deeply 4-parted ovary as above. Ours all herbs.

§ 1. *Corolla irregular funnel-form, naked in the throat: stamens unequal!*

1. ECHIUM. Two of the spreading lobes of the corolla shorter than the others. Stamens ascending, more or less protruding: filaments and style long and slender. Stigmas 2. Nutlets erect, leathery, rough-wrinkled.

§ 2. *Corolla wheel-shaped, with no tube at all.*

2. BORRAGO. Flowers, as in all the following, perfectly regular. A blunt scale at the base of each lobe of the 5-parted corolla, alternating with the conniving stamens. Filaments very short, broad, and with a cartilaginous projection behind the linear pointed anther. Nutlets erect.

6. MYOSOTIS, and 7. OMPHALODES, from the short tube to the corolla may be sought for here.

§ 3. *Corolla tubular, funnel-form, or salver-shaped, sometimes almost wheel-shaped,*

* *Open in the throat, the folds or short scales, if any, not closing over the orifice.*

3. MERTENSIA. Corolla tubular, trumpet-shaped, with the widely spreading border scarcely at all lobed and its throat perfectly naked in the common species; the slender filaments protruding. Fruit fleshy, smooth or wrinkled. Smooth plants, which is rare in this order.

4. ONOSMODIUM. Corolla tubular, with the 5 acute lobes erect or converging, the throat perfectly naked, bearing the arrow-shaped or linear and mucronate anthers: filaments hardly any. Style very slender and protruding. Nutlets stony, smooth, fixed by their base. Very rough-bristly homely plants.

5. LITHOSPERMUM. Corolla funnel-form or salver-shaped, with rounded lobes imbricated in the bud, with or without evident short and broad scales or folds in the throat. Anthers oblong, included: filaments hardly any. Nutlets stony, smooth or roughened, ovate, fixed by the base. Rough or hairy plants, mostly with red roots.

6. MYOSOTIS. Corolla very short-salver-form, the tube only about the length of the 5-toothed or 5-cleft calyx, the rounded lobes convolute in the bud, the throat with 5 small and blunt arching appendages. Anthers short, included. Nutlets smooth and hard, fixed by their base. Low and small, mostly soft-hairy plants, the small racemed flowers commonly bractless.

* * *Scales or appendages of the corolla, conspicuous one before the base of each lobe, and closing or nearly closing the orifice.*

+– *Corolla short-salver-shaped or nearly wheel-shaped: stamens included.*

7. OMPHALODES. Corolla with tube shorter than the rounded lobes. Nutlets smooth, depressed, and with a hollow basket-like top. Flowers loosely racemed: no bracts. Low smooth or smoothish herbs.

8 ECHINOSPERMUM. Corolla with tube as short as the rounded lobes, the throat closed with short rounded scales. Nutlets erect, fixed to the central column or base of the style, triangular, roughened, and bearing one or more marginal rows of barb-tipped prickles, forming small burs. Coarse weeds, with leafy-bracted racemed flowers.

9. CYNOGLOSSUM. Corolla between short funnel-form and wheel-shaped, the tube about the length of the rounded lobes; throat closed by the blunt scales. Nutlets bur-like, oblique on the expanded base of the style, to which they are fixed by their apex, roughened all over with short barbed or hooked prickles. Coarse and strong-scented plants, with racemed flowers, the lower sometimes bracted, otherwise bractless.

+– +– *Corolla tubular and more or less funnel-shaped.*

10. LYCOPSIS. Corolla with a curved tube, slightly oblique 5-lobed border, and bristly-hairy scales in the throat. Stamens included in the tube. Nutlets rough-wrinkled, erect, fixed by a hollowed base. Coarse, rough-bristly plants.

11. SYMPHYTUM. Corolla straight, tubular-funnel form, with short spreading lobes which are somewhat longer than the large awl-shaped scales and the linear or lanceolate anthers. Style slender, commonly protruding. Nutlets erect, smooth, coriaceous, fixed by a hollowed base. Coarse herbs, branching and leafy, with thickened or tuberous roots, the juice mucilaginous and bitterish, used in popular medicine. Flowers nodding in raceme-like often forked clusters, either naked or leafy-bracted at base.

II. HELIOTROPE FAMILY, the ovary not divided but tipped with the simple style, the fruit when ripe separating into 2 or 4 closed pieces or nutlets.

12. HELIOTROPIUM. Corolla short funnel-form or salver-shaped, the open throat more or less plaited. Anthers nearly sessile, included. Style short: stigma conical or capitate. Ovary 4-celled, in fruit splitting into 4 nutlets. Flowers small, in one-sided single or cymose-clustered spikes, mostly bractless.

13. HELIOPHYTUM. Corolla constricted at the throat. Style very short. Fruit mitre-shaped, splitting at maturity into 2 nutlets each 2-celled. Otherwise as in Heliotropium.

1. ÈCHIUM, VIPER'S BUGLOSS. (Name from Greek word for *viper.*)

E. vulgàre, COMMON V. or BLUEWEED. Cult. from Eu. in old gardens, and a weed in fields, Penn. to Virginia: 1°–2° high, very rough-bristly, with lanceolate sessile leaves, and showy flowers in racemed clusters, the purple corolla changing to bright blue, in summer. ②

2. BORRÀGO, BORAGE. (Old name, supposed corruption of *cor ago,* from imagined cordial properties.)

B. officinàlis, COMMON B. Cult. from Eu. in old gardens, spreading, branched, beset with sharp and whitish spreading bristles; leaves oval or oblong-lanceolate; flowers loosely racemed, handsome, blue or purplish, with dark anthers, in summer. ①

3. MERTÉNSIA. (Named for a *Prof. Mertens,* of Germany.) ♃

M. Virgínica, VIRGINIAN or SMOOTH LUNGWORT. Alluvial soil W. & S., and cult. for ornament: a *very smooth* and pale leafy plant, 1°–2° high, with obovate entire leaves, those of the root long-petioled, handsome flowers spreading or hanging on slender pedicels in loose raceme-like clusters, the light blue or at first purple corolla 1′ long: fl. spring.

4. ONOSMÒDIUM, FALSE GROMWELL. (Name means *like Onosma,* an European genus of this family.) Wild plants of the country, mostly in rich soil, in dry or alluvial ground: flowers leafy-bracted, greenish or yellowish-white, in summer. ♃

O. Virginiànum. Clothed with harsh but appressed short bristles, 1° – 2° high, with oblong leaves, and lance-awl-shaped lobes of narrow corolla sparingly bristly outside.

O. Caroliniànum. From New York W. & S.: shaggy with rough and spreading bristles, stout, 3° – 4° high, with lance-ovate or oblong-acute leaves, and lobes of rather broad corolla triangular and thickly hairy.

O. mólle. Only W.: hoary with softer and whitish appressed hairs, the oblong-ovate bluntish leaves strongly ribbed, and lobes of the triangular-pointed lobes of the narrow corolla thickly hairy outside.

5. LITHOSPÉRMUM, GROMWELL, PUCCOON. (Name from Greek, means *stony seed.*) Flowers in late spring and summer, at length scattered or as if spiked, leafy-bracted.

§ 1. *Corolla white or only yellowish in the wholly naked throat, scarcely longer than the calyx: nutlets rough-wrinkled and pitted, gray and dull.* ① ②

L. arvénse, CORN GROMWELL. Nat. from Eu. in waste dry soil, 6′ – 12′ high, roughish-hoary, with lanceolate or linear leaves and inconspicuous flowers.

§ 2. *Corolla dull whitish, rather short, with little downy scales or rather folds in the throat: nutlets smooth or with a few pores, often ivory-white.* ♃

L. angustifòlium. River-banks from Ill. S. & W.: minutely roughish-hoary, branched, 6′ – 15′ high, with linear rigid leaves, short peduncles recurved in fruit, and corolla not longer than calyx.

L. officinàle, COMMON G. of Europe, a weed by some roadsides: 1° – 2° high, branched above, with broadish-lanceolate acute leaves rough above but soft-downy beneath, and corolla longer than calyx.

L. latifòlium. From W. New York W. & S.: larger and rougher than the last, ovate and lance-ovate pointed leaves 2′ – 4′ long and prominently ribbed, those from the root larger and roundish; corolla shorter than calyx.

§ 3. *Corolla bright orange-yellow, showy, longer than calyx, almost salver-shaped, with little appendages in the throat evident: nutlets smooth, usually ivory-white.*

L. hírtum, HAIRY PUCCOON. Dry ground, chiefly S. & W.: 1° – 2° high, roughish-bristly, with lanceolate or linear leaves, or those next the flowers ovate-oblong and bristly-ciliate, the crowded flowers peduncled, tube of the corolla scarcely longer than the breadth of the border (⅔′ – 1′) and woolly-bearded at base inside.

L. canéscens, HOARY P. Mostly N. & W.: softer-hairy and somewhat hoary, 6′ – 15′ high, smaller-flowered than the preceding, and tube of corolla smooth at base inside.

L. longiflòrum, only on prairies N. W., has linear leaves, and tube of corolla 1′ or more long, many times longer than the eroded-toothed lobes.

6. MYOSÒTIS, FORGET-ME-NOT or SCORPION-GRASS. (Name in Greek means *mouse-ear,* from the short soft leaves of some species.) Fl. spring and summer.

M. palústris, TRUE F., in gardens and some waste places, with loosely branched stems ascending from a creeping base, rough-pubescent lance-oblong leaves, moderately 5-cleft calyx shorter than the spreading pedicels, its hairs not hooked nor glandular, and its lobes open in fruit; corolla light blue with a yellow eye. — Var. LÁXA, wild in wet places N., has smaller flowers on still longer pedicels. ♃

M. árvensis. Not rare in fields, &c.: hirsute, with lance-oblong acutish leaves, racemes naked at base and stalked, small blue corolla, pedicels spreading in fruit and longer than the 5-cleft equal calyx, the lobes of which are closed in fruit, and the tube beset with some hooked or glandular-tipped hairs. ① ②

M. vérna. Dry hills: bristly-hirsute, erect (4′ – 10′ high), branched from base, with oblong and blunt leaves, racemes leafy at base, very small mostly white corolla, pedicels in fruit erect and appressed at base, but abruptly bent outwards near the apex, and rather shorter than the unequal very bristly calyx, some of its bristles hooked or glandular at their tip. ① ②

7. OMPHALÒDES. (Name from the Greek, refers to the navel-shaped depression on the upper face of the nutlets.) Cult. from Eu. for ornament.

O. vérna, Blue or Spring Navelwort. Spreading by leafy runners; leaves ovate or somewhat heart-shaped, 2′–3′ long, pointed, green; flowers azure-blue, in spring. 2

O. linifòlia, White N. Erect, 6′–12′ high, loosely branched, very pale or glaucous, with broadly lanceolate leaves sparingly ciliate, the upper sessile, white or bluish flowers, and turgid nutlets toothed around the margin of the cavity. ①

8. ECHINOSPÉRMUM, STICKSEED. (Name of two Greek words for *hedgehog* and *seed*, from the nutlets.)

E. Lappula. Weed of waste grounds, especially N., roughish-hairy, erect, 1°–2° high, with lanceolate leaves, small blue flowers, and nutlets with rough-tubercled back and thickly-prickled margins: fl. all summer. ①

9. CYNOGLÓSSUM, HOUNDSTONGUE (which the name means in Greek). Fl. summer. Nutlets form burs which adhere to fleece.

C. officinàle, Common H. Coarse weed from Europe, common in pastures and roadsides: leafy, soft-pubescent, with spatulate or lance-oblong leaves, the upper ones closely sessile, crimson purple corolla, and flat somewhat margined nutlets. ②

C. Virgínicum, Wild Comfrey. Rich woods: bristly-hairy; with simple stem leafless above and bearing a few corymbed naked racemes of blue flowers, the stem leaves lance-oblong with heart-shaped clasping base, the nutlets very convex. 2

C. Morisòni, Beggar's Lice. Thickets and open woods: a common weed, 2°–4° high, with slender widely spreading branches, thin oblong-ovate leaves tapering to both ends, forking and diverging racemes of very small whitish or bluish flowers on pedicels reflexed in fruit, and convex barbed-prickly small nutlets. ① ②

10. LYCÓPSIS, BUGLOSS. (Name of Greek words for *wolf* and *face* or *aspect*.) European weeds. Fl. summer. ①

L. arvénsis, Field or Small Bugloss. Very rough-bristly weed, about 1° high, in sandy fields E.; with lance-oblong leaves, and small blue corolla little exceeding the calyx.

11. SÝMPHYTUM, COMFREY. (From Greek word meaning to *grow together* or *unite*, alluding probably to supposed healing properties.) Cult. from Old World: fl. summer. 2

S. officinàle, Common C. Rather soft-hairy; the branches winged by the decurrent bases of the oblong-lanceolate leaves; corolla yellowish-white. Naturalized sparingly in moist grounds.

S. aspérrimum, Rough C. Cult. in some gardens: stem and widely spreading branches excessively rough with short and somewhat recurved little prickles, not winged; calyx-lobes short; corolla reddish purple in bud changing to blue.

12. HELIOTRÒPIUM, HELIOTROPE (i. e., in Greek, *turning to the sun*). Fl. all summer.

* *Spikes only in pairs, or the lateral ones solitary: flowers white.* ①

H. Curassávicum. Sandy shores and banks from Virginia and Illinois S.: very smooth and pale; leaves oblong, spatulate, or lance-linear, thickish, veinless

H. Europæum. Old gardens and waste places S., introduced from Eu.; hoary-downy, 6′–18′ high; leaves oval, long-petioled, veiny.

* * *Spikes collected in terminal and several times forked cymes: woody-stemmed or shrubby house and bedding plants from Peru and Chili.* ♃

H. Peruviànum, Sweet Heliotrope. Pubescent, with ovate-oblong or lance-ovate very veiny rugose leaves, and vanilla-scented pale blue-purple flowers.

H. corymbòsum. Cult. with the other, differs mainly in the larger and deeper-blue flowers of much less fragrance.

13. HELIÓPHYTUM. (Name of the Greek words for *sun* and *plant*, indicating the resemblance to Heliotrope.)

H. Índicum, Indian Heliotrope: hairy low plant, nat. from India as a weed in waste ground S.; with ovate heart-shaped leaves, and solitary spikes of small purplish flowers, in summer; a cavity before each seed-bearing cell of the 2-lobed fruit. ①

81. HYDROPHYLLACEÆ, WATERLEAF FAMILY.

Plants in some sort resembling both the foregoing and the following families, in the arrangement of the flowers more commonly imitating the former; differing from both in the 1-celled ovary and pod with 2 parietal placentæ. In some the placentæ unite in the axis, making a two-celled ovary. Style 2-cleft or else 2 separate styles. Ovules at least 2 to each placenta. Seeds with a small embryo in hard albumen. Juice inert and watery. Leaves mostly alternate, simple or compound. The following are all N. American plants, some wild, the others cult. for ornament from the West.

§ 1. *Style 2-cleft: ovary and pod 1-celled, with two parietal placentæ,*

* *These fleshy and so broad that they line the ovary, and enclose the (mostly 4) ovules and seeds: corolla usually convolute in the bud, commonly with 5 or 10 folds, scales, or other appendages down the inside of the tube.*

1. HYDROPHYLLUM. Calyx 5-parted, sometimes with small appendages at the sinuses, not enlarged in fruit. Corolla bell-shaped. Style and mostly hairy filaments protruded: anthers linear. Pod small, globose, ripening 1–4 spherical seeds. Flowers in crowded cymes or clusters. Leaves alternate, slender-petioled.
2. NEMOPHILA. Calyx 5-parted, and with a reflexed appendage in each sinus, somewhat enlarging in fruit. Corolla open bell-shaped or wheel-shaped, longer than the stamens. Flowers solitary and long-peduncled. Leaves mostly opposite, at least the lower ones.

* * *Placentæ narrow, adherent directly to the walls, or else borne on an incomplete partition and projecting into the cell, where they sometimes meet: lobes of the corolla imbricated in the bud.*

3. PHACELIA. Calyx 5-parted, the divisions narrow; no appendages at the sinuses. Corolla open bell-shaped, approaching wheel-shaped. Stamens and style often protruded. Pod 4–many-seeded. Leaves alternate. Flowers in one-sided raceme-like clusters or spikes.
4. WHITLAVIA. Corolla tubular-bell-shaped or slightly contracted at the throat, the 5 short and broad lobes abruptly and widely spreading. (Pod many-seeded.) Otherwise as the last section of Phacelia.

§ 2. *Styles 2 (rarely 3), separate quite to the base: ovary and pod 2-celled: seeds minute and very numerous.*

5. HYDROLEA. Calyx 5-parted. Corolla open-bell-shaped or approaching wheel-shaped, rather shorter than the stamens: filaments enlarged at base. Herbs, or somewhat shrubby, with entire leaves and often spines in their axils. Flowers in loose axillary clusters.

WIGANDIA, from South America, with very large rounded leaves and sharp or stinging bristles, is of late planted out as an ornamental leaf-plant, but is as yet uncommon.

1. HYDROPHÝLLUM, WATERLEAF, is a translation of the name from the Greek, the application obscure. Plants of rich woods, &c. Flowers white or bluish-tinged, in early summer. 2

* *Calyx with minute appendages if any: rootstocks creeping, scaly-toothed.*

H. macrophýllum. From Ohio W. & S. W.: rough-hairy, with leaves pinnately divided into 9–13 cut-toothed divisions or leaflets; a globular cluster of flowers on a very long peduncle.

H. Virgínicum. Very common N. & W.: smooth or smoothish, with 5–7 main divisions to the pinnate leaves, the lowest pair 2-parted, and calyx-lobes bristly-ciliate.

H. Canadénse. Chiefly N.: barely 1° high, nearly smooth, the roundish leaves palmately 5–7-lobed and with heart-shaped base, or some minute leaflets on the petioles, which are longer than the peduncles of the flower-cluster.

* * *Calyx with a conspicuous reflexed appendage in each sinus.*

H. appendiculàtum. From New York W. & S.: pubescent or hairy, with rounded palmately 5-lobed leaves or some of them pinnately divided, rather loose flower-clusters, and bristly-hairy calyx.

2. NEMÓPHILA. (Name from the Greek, means *lover of the grove.*) Low spreading plants cultivated for ornament; all but the first from California: fl. summer. ①

N. phacelioides. Wild from Arkansas S., and sparingly cult.; with ascending stems 1°–2° long, alternate leaves pinnately parted into 3–9 oblong entire divisions, and purplish-blue corolla 1½′ broad.

N. insígnis. Slender, procumbent, with lobes of the pinnate leaves cut-toothed, and pure blue corolla 1′ broad.

N. maculàta. Prostrate, with leaves all opposite and mostly sessile, the lower lyrate-pinnatifid, upper sparingly cut-toothed, and white corolla with violet patch on each lobe.

N. atomària. Procumbent; leaves opposite, pinnatifid; corolla smaller, white sprinkled with chocolate-brown spots.

3. PHACÈLIA. (Name from Greek word for a cluster.) Several species cult. for ornament: fl. spring or summer.

§ 1. True Phacelia, *with only* 4 *ovules and seeds: lobes of corolla entire.*

P. congésta. Cult. from Texas, &c.: rather pubescent, with leaves pinnately divided or cleft into few oblong or ovate cut-toothed leaflets or lobes, and small blue flowers in 3 or 4 spikes at the summit of a slender peduncle; stamens slightly protruding. ①

P. tanacetifòlia, from California: taller, bristly-hairy, with narrower pinnatifid leaflets, larger flowers in longer dense spikes, and long stamens. ①

P. bipinnatífida. Wild from Ohio S. & W. in rich shady soil: 1°–2° high, branched, glandular-hairy, with leaves twice pinnately divided into ovate cut-lobed leaflets, flowers slender pedicelled in long loose racemes, violet-blue corolla ½′ or more broad. ②

§ 2. Cosmanthus, *with* 4 *ovules and seeds, and fringed lobes to corolla.* ① ②

P. Púrshii. Shady soil from Penn. W. & S. and cult. under the name of the next: slender, 8′–12′ high; lobes of pinnatifid leaves several, lance-oblong, acute; flowers of the raceme numerous, on slender pedicels; corolla light blue or whitish, ½′ broad; filaments hairy below.

P. fimbriàta, the true plant grows only in the high Alleghanies S., is smaller, with 3–7 rounded or oblong blunt divisions to the leaves, few and smaller white flowers.

§ 3. Eutoca, *with seeds or at least ovules several or many: corolla-lobes entire.*

P. parviflòra. Shaded banks from Penn. to N. Car.: scarce, delicate little plant, 3′–6′ high, with pinnately divided or cleft leaves, a raceme of few flowers on slender pedicels, bluish corolla less than ½′ wide, and few seeds. ②

P. víscida, cult. from California as EÙTOCA VÍSCIDA: clammy all over with dark glandular hairs, rather coarse; leaves ovate, cut-toothed, short-petioled; racemes single terminating the branches; corolla deep blue, 1′ or less wide; pod many-seeded. ①

4. WHITLÀVIA. (Named by the lamented Professor Harvey for his friend *Mr. Whitla.*) Fl. summer. ①

W. grandiflòra. Cult. for ornament, from California: resembles Phacelia viscidain growth and foliage, but only slightly clammy, the roundish-ovate or slightly heart-shaped leaves coarsely toothed, on longer petioles; racemes loose; corolla 1′ or more long, violet-blue (also a white variety); stamens and style very slender and protruding.

5. HYDRÒLEA. (Named from Greek word for *water;* the plants aquatic or in wet places.) Fl. summer. ♃

H. quadriválvis, of S. E. States, has hairy stems; lanceolate acute leaves tapering to the base, and lanceolate sepals nearly as long as the corolla.

H. affìnis, of river-banks, from S. Illinois S., is smooth, with short-petioled lanceolate leaves, and ovate sepals as long as the corolla.

H. ovàta, of S. W. States, has soft-downy stems, ovate leaves, looser flowers, and lanceolate villous sepals.

82. POLEMONIACEÆ, POLEMONIUM FAMILY.

Chiefly herbs, with regular flowers, persistent 5-cleft calyx, the 5 lobes of the monopetalous corolla convolute in the bud, 3-lobed style, 3-celled ovary and pod; the single, few, or many seeds in each cell borne on the thick axis. Embryo straight in the axis of albumen. Insipid and innocent plants, the juice watery. Nearly all are N. American plants, many cult. for ornament.

§ 1. *Erect or diffuse herbs, not climbing, and with nothing resembling stipules.*

1. PHLOX. Calyx narrow, prismatic or plaited, 5-toothed or 5-cleft. Corolla salver-shaped, with a long tube (Lessons, p. 90, fig. 255), in which the 5 short and unequally inserted stamens are included. Ovary often with 2 ovules, but the short pod with only one seed in each cell. Leaves entire and mostly sessile, the lower all opposite, upper often alternate.
2. GILIA. Calyx tubular or bell-shaped, 5-cleft. Corolla of various shapes. Stamens equally inserted and projecting from the throat of the corolla, not declined. Ovules and seeds several in each cell. Leaves either entire, cut, or divided.
3. POLEMONIUM. Calyx bell-shaped. Corolla open-bell-shaped or short-funnel form. Stamens slender, like those of Gilia, but declined, hairy-appendaged at the base. Leaves pinnate, alternate.

§ 2. *Tall-climbing by compound tendrils on the pinnate leaves: lowest leaflets close to the stem, unlike the others, imitating stipules.*

4. COBÆA. Calyx of 5 large leaf-like divisions, the margins of which, applied each to each, appear like 5 winged angles. Corolla bell-shaped, with short and broad spreading lobes. Stamens declined. A fleshy disk around the base of the ovary. Seeds numerous in each cell of the pod, winged. Peduncles axillary, 1-flowered, leafy-bracted near the base, naked above. Leaves alternate.

1. PHLÓX. (Greek for *flame,* anciently applied to Lychnis, and transferred to these North American plants.)

§ 1. ① *Cultivated for ornament from Texas: fl. all summer.*

P. Drummóndii. From this come all the annual Phloxes of the gardens: rather low, branching and spreading, somewhat clammy-pubescent, with corymbs of purple, crimson, rose-colored, or even white, showy flowers.

§ 2. ♃ *Wild in mostly dry or rocky ground, also common in gardens, where the species are much crossed and varied.*

* *Stems erect: flowers in oblong or pyramidal panicle, with short peduncles and pedicels: lobes of corolla entire, pink-purple, and with white varieties. Wild from Pennsylvania S. and W.: fl. summer.*

P. paniculàta. Smooth, or some varieties roughish or soft hairy, 2°–4° high, stout; leaves oblong or ovate-lanceolate and mostly with tapering base; panicle broad; calyx-teeth sharp-pointed.

P. maculàta. Smooth; stem slender, 1°–2° high, purple-spotted lower leaves lanceolate, upper lance-ovate from a rounded or somewhat heart-shaped base; panicle long and narrow, leafy below; calyx-teeth hardly pointed.

* * *Stems ascending or erect, but often with a prostrate base, 1°–3° high: whole plant smooth, not clammy nor glandular: flowers corymbed: lobes of corolla round and entire. Wild chiefly W. and S., seldom cult.: fl. summer.*

P. Carolìna. Leaves varying from lanceolate to ovate, or the upper heart-shaped; flowers crowded, short-peduncled, pink; calyx-teeth acute.

P. glabérrima. Slender; leaves often linear-lanceolate, 3′–4′ long; flowers fewer and loose, pink or whitish; calyx-teeth sharp-pointed.

* * * *Flowering stems ascending, or in the first erect, low, terminated by a loose corymb, which is clammy-pubescent more or less, as well as the thinnish leaves: flowers mostly pedicelled: calyx-teeth very slender: fl. late spring.*

P. pilòsa. From N. Jersey to Wisconsin & S.: mostly hairy; erect stems 1° or so high; leaves lanceolate or linear and tapering to a point (1′–2½′ long); flowers loose, with spreading awn-pointed calyx-teeth; lobes of pink, rose, or rarely white corolla obovate and entire.

P. amœna. Barrens from Virg. to Ill. & S.: pubescent, spreading from the base, 6′–1° high, leaves lanceolate, or broadly oblong or ovate on sterile shoots, short; flowers in a crowded leafy-bracted corymb, with straight hardly awn-pointed calyx-teeth; corolla purple, pink, or nearly white.

P. réptans. Moist woods from Penn. and Kentucky S.: spreading by long runners, which bear round-obovate often smoothish leaves, those of the low flowering stems oblong or ovate (about ½′ long); flowers few but crowded; lobes of the deep pink-purple corolla round-obovate, large (1′ broad).

P. divaricàta. Moist woods from N. New York W. & S.: soft-pubescent; stems loosely spreading; leaves ovate-oblong or broad-lanceolate (1′–2′ long); flowers loosely corymbed and peduncled; corolla large, pale lilac, bluish, or lead-colored, the lobes wedge-obovate or commonly inversely heart-shaped and as long as the tube.

* * * * *Stems creeping and tufted, rising little above the ground, almost woody, persistent, as are the rigid and crowded glandular-pubescent leaves: flowers few in the depressed clusters, in early spring.*

P. subulàta, Ground or Moss Pink. Wild on rocky hills W. & S. of New England, and common in gardens, forming broad mats; leaves awl-shaped or lanceolate, at most ½′ long; corolla pink-purple, rose with a darker eye, or varying to white, the wedge-obovate lobes generally notched at the end.

2. GÍLIA. (Named for one *Gil*, a Spanish botanist.) Species abound from Texas and Kansas to California. Several are choice annuals of the gardens: fl. summer.

G. coronopifòlia, or Ipomopsis, called Cypress Gilia from the foliage resembling that of Cypress-Vine: wild S. and cult.; has erect wand-like stem 2°–3° high, thickly clothed with alternate crowded leaves pinnately divided into thread-like leaflets, and very long and narrow strict leafy panicle of showy flowers; the corolla tubular-funnel form, light scarlet with whitish specks on the lobes inside, 1½′ long. (Lessons, p. 90, fig. 249.) ②

G. androsàcea, or Leptosìphon androsaceus, of California; low and slender, with opposite leaves palmately cleft into 5–7 narrow linear divisions, a head-like cluster of flowers with very long and slender but small salver-shaped corolla, lilac or whitish with a dark eye. ①

G. trícolor, of California: with branching stems, about 1° high, scattered alternate leaves 2 – 3 times pinnately dissected into short linear divisions, flowers panicled at the end of the branches, short funnel-form corolla with lilac-purple or whitish lobes, brown-purple throat, and yellow tube. ①

G. capitàta, of California and Oregon; 1° – 2° high, with alternate leaves twice pinnately divided into small linear or thread-like leaflets or lobes, and numerous small blue flowers crowded in heads at the end of naked branches; the corolla narrow funnel-form with lanceolate lobes. ①

3. POLEMÒNIUM, GREEK VALERIAN, JACOB'S LADDER. (Ancient name, from the Greek word for *war,* or in honor of a philosopher or king named *Polemon.*) Fl. early summer. ♃

P. réptans. Woods of Middle States, also cult.: smooth, with weak and spreading (but never creeping) stems 6′ – 10′ long, 7 – 11 lance-ovate or oblong leaflets, small corymbs of nodding light blue flowers, and stamens and style not longer than the corolla.

P. cærùleum. Cult. in gardens from Eu., also rarely wild N.: smooth or sometimes hairy; with erect stem 1° – 3° high, 9 – 21 mostly lanceolate and crowded leaflets, clusters of bright blue flowers collected in a long panicle, and stamens and style longer than the lobes of the corolla, which is 1′ broad.

4. COBÆA. (Named for one *Cobo,* a Spanish priest in Mexico, from which country the common species was introduced into cultivation.) ♃

C. scándens. Smooth, tall-climbing by its much branching tendrils; leaflets ovate; dull purple or greenish corolla 2′ or more long, long filaments coiling spirally when old: fl. all summer, usually cult. as an annual.

83. CONVOLVULACEÆ, CONVOLVULUS FAMILY.

Twining, trailing, or rarely erect plants, (ours herbs,) commonly with some milky juice, alternate leaves, no stipules; regular monopetalous flowers with 5 (rarely 4,) imbricated sepals, as many separate stamens, corolla convolute or twisted in the bud, a 2 – 4-celled ovary and pod with only 1 or 2 ovules erect from the base of each cell, becoming large seeds, containing a curved or coiled conspicuous embryo in some mucilaginous (or when dry, harder) albumen.

I. CONVOLVULUS FAMILY PROPER; with ordinary foliage, axillary peduncles bearing one or more usually showy flowers, and embryo with broad leaf-like cotyledons folded and crumpled in the seed. (Lessons, p. 21, fig. 40 – 43.) Calyx of 5 separate sepals.

§ 1. *Style single and entire: stigmas* 1 – 3.

* *Calyx naked, i. e. not enclosed by a pair of leafy bracts.*

1. QUAMOCLIT. Corolla nearly salver-shaped or trumpet-shaped, with a long tube, the border not twisted in the bud. Stamens and style commonly protruded. Stigma capitate, more or less 2-lobed. Pod 4-celled: cells 1-seeded. (Lessons, p. 101, fig. 202, 203.)
2. IPOMŒA. Corolla various, more commonly funnel-form, the border twisted in the bud. Stamens mostly included. Stigma capitate, commonly 2 – 3-lobed. Pod 2 – 4-celled.
3. CONVOLVULUS. Corolla open funnel-form or almost bell-shaped. Stamens included. Stigmas 2, linear. Pod 2-celled: cells 2-seeded.

* * *Calyx surrounded and enclosed by a pair of large leafy heart-shaped bracts.*

4. CALYSTEGIA. Corolla open funnel-form, the wide-spreading border obscurely lobed or entire. Stamens included. Style bearing 2 linear or oblong stigmas. Pod 4-seeded. Peduncles 1-flowered.

§ 2. *Style 2-cleft or 2 separate styles, rarely 3. Spreading or trailing, not twining.*

6. BONAMIA. Like Convolvulus, but the styles 2 or sometimes 3, or in one species 2-cleft, and stigmas capitate. Peduncles 1–7-flowered.

6. EVOLVULUS. Corolla short and open funnel-form, or almost wheel-shaped. Styles 2, each 2-cleft: the 4 stigmas obtuse. Pod 2-celled: cells 2-seeded.

II. DODDER FAMILY; slender parasitic twiners, without green herbage and with only some minute scales in place of leaves; embryo slender and spirally coiled in the seed, destitute of cotyledons.

7. CUSCUTA. Calyx 4–5-cleft, or of 5 separate sepals. Corolla short, 4–5-cleft. Stamens with a scale-like mostly fringed appendage at their base. Styles 2 in our species. Ovary 2-celled: cells 2-ovuled. Pod commonly 4-seeded.

1. QUÁMOCLIT. (Aboriginal Mexican name.) Twiners, with small flowers red or crimson, and with pale or white cultivated varieties, in summer, open through the day. ①

Q. vulgàris, CYPRESS-VINE. Cult. from Mexico: leaves pinnately parted into slender almost thread-shaped divisions; peduncles 1-flowered; border of the narrow corolla 5-lobed.

Q. coccínea. Run wild S. & W.: leaves heart-shaped, pointed; sepals awn-pointed; peduncles several-flowered; border of (1′ long) corolla merely 5-angled.

2. IPOMŒA, MORNING GLORY. (Greek-made name.) Fl. summer.

§ 1. *Ovary and pod 3-celled (or accidentally 4-celled), with 2 seeds in each cell: stigma more or less 3-lobed: corolla funnel-form, opening in early morning for a few hours: stems twining freely, hairy, the hairs more or less retrorse.*

I. purpùrea, COMMON M. Cult. from Trop. Amer. and wild around dwellings; with heart-shaped pointed entire leaves, 3–4-flowered peduncles, and purple sometimes variegated or nearly white corolla, 2′ long. ①

I. Nil. Cult. or run wild S.: with heart-shaped 3-lobed leaves, 1–3-flowered peduncles, slender-pointed sepals, and blue-purple or sometimes white corolla 1′–2′ long. ①

I. limbàta or **albo-marginàta,** perhaps a var. of the preceding: a tender species, with leaves little lobed, angled or entire, and larger corolla with deep violet border, edged with white 2½′ broad. ①

I. Leàrii, cult. from S. Amer.: tender, less hairy, with heart-shaped and some deeply 3-lobed leaves, many flowers crowded on the summit of the peduncle, and deep violet-blue corolla, 3′ long and border 3′ wide. ♃

§ 2. *Ovary and pod 2-celled, the cells 2-seeded, or sometimes each cell divided by a partition making 4 one-seeded cells: lobes of the stigma if any only 2.*

I. Bona-Nóx, or CALONÝCTION SPECIÒSUM. Cult., also wild far S.: tall-twining, very smooth, but stems often beset with soft almost prickly projections; leaves heart-shaped, halberd-shaped, or angled; peduncles long, 1-few-flowered; corolla salver-form with a slender tube 3′–4′ long and the border still broader, white, opening at evening.

I. Batátas, SWEET POTATO. Cult. from East Indies: creeping, seldom twining, smooth, producing the large fleshy edible roots for which the plant is cultivated; leaves variously heart-shaped, halberd-shaped, or triangular, sometimes cut-lobed; peduncles bearing 3 or 4 flowers; corolla funnel-form, purple, 1½′ long; pod with 4 one-seeded cells. ♃

I. Michaúxii. Light soil along the coast S.: creeping or twining, with heart-shaped or triangular sometimes lobed leaves downy beneath; flowers downy; corolla purplish-white with purple eye, 3′–4′ long, opening at night; pod partly 4-celled, with silky seeds; root extremely large and fleshy. ♃

I. pandurà̀ta, WILD POTATO-VINE or MAN-OF-THE-EARTH. Sandy or gravelly soil, Conn. to Ill. & S.: trailing or twining, stout, smooth, with heart-shaped and sometimes fiddle-shaped or halberd-3-lobed leaves, 1 – 5-flowered peduncles, small bracts, and open funnel-form white corolla with deep purple eye, 2′ – 3′ long; root very large and deep. 2ℓ

I. sagittifò̀lia. Salt-marshes, from North Carolina S.: smooth, with stems twining 2° – 3° high, or trailing, narrow lanceolate or linear long-sagittate leaves, 1 – 3-flowered club-shaped peduncles, and the bright purple funnel-form corolla 2′ – 3′ long. 2ℓ

I. lacunò̀sa. Low grounds, Penn. to Ill. and S.: twining, nearly smooth, with heart-shaped nearly entire leaves, short 1 – 3-flowered peduncles, small white 5-lobed corolla about ½′ long and twice the length of the pointed ciliate sepals, and slightly hairy pod. ①

I. commutà̀ta. Low grounds S. & W.: rather hairy, twining; with thin heart-shaped and sometimes angled or 3 – 5-lobed leaves, 4-angled 1 – 5-flowered peduncles about the length of the slender petioles; purple corolla 1′ – 2′ long and 4 – 5 times the length of the pointed ciliate sepals; pod hairy.

3. CONVÓLVULUS, BINDWEED. (From Latin *convolvo,* to roll around or twine.) Fl. summer.

C. arvénsis, FIELD BINDWEED of Eu., is a weed on the coast E.: spreading and low-twining, smoothish; leaves ovate-oblong and narrow-shaped; peduncles 1-flowered; corolla white tinged reddish, less than 1′ long. 2ℓ

C. trícolor. Cult. from S. Europe in gardens; hairy, low, with ascending branching stems, lance-obovate or spatulate almost sessile leaves, 1-flowered peduncles, rather large and showy flowers opening in sunshine, the corolla blue with pale or white throat and yellow tube. ①

4. CALYSTÈGIA, BRACTED BINDWEED. (From Greek words denoting the *calyx covered,* that is, by the bracts.) Fl. all summer.

C. sèpium, HEDGE B. Wild in low grounds, also planted: twining freely, sometimes also trailing, spreading by running rootstocks; smooth, also a downy variety; leaves triangular and halberd-shaped or arrow-shaped, with the lobes at base obliquely truncate and sometimes toothed or sinuate; peduncles 4-angled; corolla white or light rose-colored, 1½′ – 2′ long. 2ℓ

C. spithamæ̀a. Dry sterile ground; downy, not twining, 6′ – 12′ high; leaves oblong, some of them more or less auricled or heart-shaped at the base; corolla white, 2′ long. 2ℓ

5. BONÁMIA. (Named for *F. Bonamy.*) Low, small-flowered: corolla more or less silky or hairy outside: fl. summer: chiefly S. 2ℓ

B. humistrà̀ta. Dry pine barrens from Virg. S.: sparsely hairy or smoothish; leaves varying from oblong with heart-shaped base to linear; sepals smooth; corolla white, almost 1′ long; filaments hairy; styles united at base.

B. aquà̀tica. Along ponds S.: finely soft-downy; leaves varying as in the preceding; sepals silky; corolla pink or purple ½ long; filaments smooth; styles nearly separate.

B. Pickeringii. Sandy barrens from N. Jersey S., scarce: leaves nearly linear, narrow, tapering to a sessile base; bracts leaf-like and longer than the flowers; sepals hairy; corolla white, hardly ½′ long; styles united to above the middle, and with stamens also protruding.

6. EVÓLVULUS. (From Latin for *unroll,* that is, it does not twine.) Low and diminutive small-flowered plants, only S. Fl. summer. 2ℓ

E. argénteus. Dry ground from Missouri S.: tufted from a woody base, 5′ – 7′ high, silky-woolly all over; broadly lanceolate leaves crowded, mostly nearly sessile, as are the flowers in their axils; corolla purple; ¼′ broad.

E. seríceus. Damp ground S. & S. W.: slender-stemmed, silky with fine appressed hairs, except the upper face of the scattered lance-linear leaves; corolla white or bluish, not ½′ broad.

7. CÚSCUTA, DODDER. (Old name, of uncertain derivation.) Plants resemble threads of yarn, yellowish or reddish, spreading over herbs and low bushes, coiling around their branches, which they adhere to and rob of their juices. Flowers small, mostly white, clustered.

§ 1. *Stigmas slender; pod opening by a transverse division all round near the base, leaving the partition behind. Natives of Europe: fl. early summer.*

C. Epílinum, FLAX DODDER. Growing on flax, which it injures; occasionally found in our flax-fields; flowers globular, in scattered heads; corolla 5-parted. ①

§ 2. *Stigmas capitate: pods bursting irregularly if at all: wild species of the country, mostly in rich or low ground: fl. summer and autumn.* ①

* *Flowers in rather loose clusters, mostly short-pedicelled, the scaly bracts few and scattered: calyx 4 – 5-cleft.*

+ *Corolla with cylindrical tube, in fruit covering the top of the pod.*

C. tenuiflòra. On shrubs and tall herbs from N. Jersey W. & S., in swamps: pale; tube of the corolla twice the length of its ovate acute spreading lobes and of the ovate blunt calyx-lobes.

C. infléxa. On shrubs and tall herbs in prairies and barrens W. & S.: corolla fleshy, mostly 4-cleft, its tube no longer than the ovate acutish crenulate erect or inflexed lobes of the corolla and the acute keeled calyx-lobes.

C. decòra. Wet prairies S. W.: with larger flowers, the corolla broadly bell-shaped, its 5 lobes lance-ovate and acute.

++ *Corolla bell-shaped, remaining at the base of the ripe pod.*

C. arvénsis. On low herbs, in fields and barrens from New York to Ill. & S. W.: flowers earliest (June, July) and smallest; tube of corolla shorter than its 5 lanceolate pointed spreading lobes, much longer than the stamens.

C. chlorocárpa. On low herbs, in wet soil, from Delaware W. & S.W.: orange-colored; open bell-shaped corolla with lobes about the length of the mostly 4 acute lobes and the stamens; pod large, depressed, greenish-yellow.

C. Gronòvii. The commonest E. & W. and the only one N. E.; on coarse herbs and low shrubs in wet places; bell-shaped corolla with tube usually longer than its 5 (rarely 4) ovate blunt spreading lobes; its internal scales large and copiously fringed.

* * *Flowers sessile in compact mostly continuous clusters, making large bunches or close matted coils, when old resembling pieces of rope twisted around the stems of coarse herbs or shrubs: calyx of separate sepals surrounded by similar crowded bracts: remains of the corolla borne on the top of the ripe pod.*

C. compácta. On shrubs, from N. York S. & W.: bracts (3 – 5) and sepals round and appressed; tube of corolla cylindrical.

C. glomeràta. On Golden rods and other coarse Compositæ, from Ohio W. & S. W.: the numerous oblong scarious bracts closely imbricated with recurving tips; sepals similar, shorter than the cylindraceous tube of the corolla.

84. SOLANACEÆ, NIGHTSHADE FAMILY.

Plants with rank-scented herbage (this and the fruit more commonly narcotic-poisonous, colorless juice), alternate leaves (but apt to be in pairs and unequal), regular flowers with the parts usually in fives, but the ovary mostly 2-celled, the many-seeded placentæ in the axis. The seeds have a slender usually curved embryo in fleshy albumen. (Lessons, p. 23, fig. 50, 51.) The order runs on the one hand into Scrophulariaceæ, which a few species approach in a somewhat irregular corolla, but their stamens are as many as the lobes. On the other hand the Nolana group is appended, which differs from all in its separate ovaries around a common style.

I. NOLANA FAMILY, with few or many separate ovaries collected in a circle or heap around the base of a single style. Low and spreading plants.

1. NOLANA. Calyx 5-cleft, foliaceous. Corolla short and open funnel-form, plaited in the bud. Stamens 5. Style 1: stigma capitate or club-shaped. Ovaries 3–40, becoming 1–4-celled drupelets or nutlets, each cell 1-seeded.

II. NIGHTSHADE FAMILY PROPER, with only one 2-celled or sometimes 3–5-celled ovary as well as style, the many-seeded placentæ in the axis, usually much projecting into the cell.

§ 1. *Corolla wheel-shaped, lobed or parted into 5 or sometimes more divisions, plaited and valvate or the margins turned inwards in the bud: the tube very short: anthers conniving around the style: fruit a berry.*

2. LYCOPERSICUM. Like Solanum, except that the anthers are united by a membrane at their tips and the cells open lengthwise. Leaves pinnately compound.
3. SOLANUM. Stamens with anthers equalling or mostly longer than the very short filaments, usually not united, the cells opening by a hole at the apex. (Lessons, p. 90, fig. 252, 253.) Leaves simple or pinnate.
4. CAPSICUM. Stamens with slender filaments much longer than the short and separate commonly heart-shaped anthers, their cells opening lengthwise. Berry sometimes dry and inflated, then becoming 1-celled.

§ 2. *Corolla between wheel-shaped and funnel-form, plaited in the bud, the border very moderately if at all lobed: anthers separate, opening lengthwise: calyx bladdery-inflated after flowering, enclosing the globular berry.*

5. PHYSALIS. Calyx 5-cleft. Corolla mostly somewhat 5-lobed. Stamens erect. Fruit a juicy, often edible, 2-celled berry.
6. NICANDRA. Calyx 5-parted and angled, the divisions somewhat arrow-shaped. Corolla with widely-spreading border almost entire. Fruit a dry 3–5-celled berry.

§ 3. *Corolla bell-shaped, funnel-form, tubular, or salver-shaped: anthers separate, opening lengthwise: calyx not bladdery-inflated.*

* *Calyx urn-shaped in fruit, enclosing the pod: corolla considerably irregular.*

7. HYOSCYAMUS. Calyx 5-lobed, the spreading border becoming reticulated, enclosing the 2-celled pod, which opens by the top falling off as a lid. Corolla short funnel-form, with the plaited border more or less oblique and unequal. Stamens declined.

* *Calyx 5-parted to near the base, the lobes foliaceous.*

8. ATROPA. Calyx with ovate divisions, in fruit enlarging and spreading under the globose purple berry. Corolla between bell-shaped and funnel-form, with 5 triangular-ovate lobes. Stamens and style somewhat declined, slender.
9. PETUNIA. Calyx with narrow somewhat spatulate lobes much longer than the tube. Corolla funnel-form or somewhat salver-shaped, the 5-lobed border commonly a little unequal. Stamens included in the tube, unequal. Pod 2-celled, 2-valved.

* * * *Calyx tubular, prismatic, or bell-shaped,*

+– *Covering the dry pod or nearly so: corolla salver-shaped or funnel-form, the lobes plaited in the bud: seeds minute.*

10. NIEREMBERGIA. Corolla with very slender thread-like tube (½′–1′ long), abruptly expanded at the narrow throat into a saucer-shaped or almost wheel-shaped 5-lobed border. Stamens short, borne on the throat. Stigma kidney-shaped and somewhat 2-lipped. Flowers scattered.
11. NICOTIANA. Corolla with a regular 5-lobed border. Stamens inserted on its tube, included: filaments straight. Stigma capitate. Pod 2–4-valved from the apex. Flowers more or less racemed or panicled.

+– +– *Calyx prismatic, falling away after flowering, leaving the 2–4-celled pod naked.*

12. DATURA. Corolla funnel-form, strongly plaited in the bud, and with 5 or more pointed teeth. (Lessons, p. 89, fig. 246; p. 98, fig. 282.) Filaments

slender. Stigma somewhat 2-lobed or 2-lipped. Pod globular, in the common species prickly and 4-celled, but the 2 placentæ-bearing or false partitions often incomplete. Seeds large and flat, somewhat kidney-shaped. Flowers terminal or in the forks.

+ + + *Calyx bell-shaped, cup-shaped, or short-tubular, in fruit persistent under or partly covering the 2-celled berry; shrubs, with entire feather-veined leaves.*

13. CESTRUM. Corolla tubular-funnel-form or club-shaped, the lobes folded or plaited lengthwise in the bud. Stamens included. Stigma capitate. Ovary with few ovules in each cell. Berry few-seeded. Flowers in clusters.

14. LYCIUM. Parts of the flower often in fours. Corolla funnel-form, bell-shaped or tubular, the lobes imbricated in the bud. Stigma capitate. Berry many-seeded, red or reddish. Flowers solitary or umbelled, lateral.

1. NOLÀNA. (From Latin *nola*, a little bell.) Cult. for ornament, from coast of Peru and Chili; the following procumbent and spreading, rather fleshy-leaved, smooth except some scattered hairs on the stalks, the showy blue flowers solitary on axillary or lateral peduncles, opening in sunshine, all summer.

N. atriplicifòlia, with obovate or broadly spatulate leaves (resembling those of Spinach, whence the specific name); sky-blue corolla 2′ wide with white and yellowish centre; ovaries numerous in a heap, each 1-celled and 1-seeded. ①

N. prostràta, now less common, has more petioled rather narrower leaves, smaller pale violet-blue flower striped with purple, and few ovaries each of 2–4 cells. ①

2. LYCOPÉRSICUM, TOMATO. (Name in Greek means *wolf-peach*, no obvious application.) Fl. summer.

L. esculéntum, Tomato, cult. from trop. America, includes the manifold varieties and forms; hairy, rank-scented; leaves interruptedly pinnate, larger leaflets cut or pinnatifid; flowers yellowish, by cultivation having their parts often increased in number, the esculent red berry becoming several celled. ①

3. SOLÀNUM, NIGHTSHADE, &c. (Derivation uncertain.) Flowers mostly in corymb or raceme-like clusters, in summer.

§ 1. *More or less prickly herbs, with acute elongated-lanceolate anthers.*

* *Very prickly calyx enclosing the dry berry: anthers declined, unequal, one of them much longer than the rest, leaves sinuately once to thrice pinnatifid.* ①

S. rostràtum. Wild on plains W. of Mississippi, and becoming a weed in some gardens, has yellow flowers, 1′–1½′ in diameter.

S. heterodòxum. Wild S. W. beyond the Mississippi, sometimes cult. for ornament, has violet-blue flowers, and the more divided leaves resemble those of Watermelon, but are very prickly.

* * *Calyx mostly somewhat prickly but not enclosing the fruit: anthers nearly equal.*

S. Carolinénse, Horse-Nettle. Wild weed in sandy soil from Conn. S. roughish-downy, 1° high, with ovate-oblong angled or sinuate-lobed leaves, yellowish prickles, and pale blue or white flowers almost 1′ wide. 2ℓ

S. aculeatìssimum. Weed introduced into waste places S., 1°–2° high, bristly hairy, greener and more prickly than the foregoing, with smaller white flowers. ①

S. Melongèna, Egg Plant, Aubergine. Cult. for the large oblong or ovate violet-colored or white esculent fruit (2′–6′ long); leaves ovate, rather downy, obscurely sinuate; corolla violet with yellow eye. ①

§ 2. *Plants not at all prickly: anthers blunt.*

S. nìgrum, Black or Common Nightshade. Low weed of shady grounds, much branched, nearly smooth, with ovate wavy-toothed or sinuate leaves, very small white flowers, and globular black berries said to be poisonous. ①

S. tuberòsum, POTATO. Cult. from Chili for the esculent tubers; leaves pinnate, of several ovate leaflets and some minute ones intermixed; flowers blue or white; berries round, green. 2

S. Dulcamàra, BITTERSWEET. Nat. from Eu. in moist cult. and waste grounds; smoothish, with tall stems woody at base and disposed to climb, ovate and heart-shaped leaves, some of the upper ones halberd-3-lobed, or with one or two pairs of smaller leaflets or lobes at base, corolla violet-purple with a pair of greenish spots on the base of each lobe, and oval red berries. 2

S. jasminoìdes. Woody-stemmed house-plant from Brazil, tall-climbing by its petioles, very smooth, with oblong ovate or slightly heart-shaped entire leaves, or some of them divided into 3 leaflets, and clusters of white or bluish flowers. 2

S. Pseudo-Cápsicum, JERUSALEM CHERRY. Shrubby house-plant from Madeira, cult. for the ornamental bright red berries, resembling cherries; smooth, with lance-oblong entire leaves and small white flowers. 2

4. CÁPSICUM, CAYENNE or RED PEPPER. (Said to come from Greek word meaning to gobble or eat quickly.) Originally all South American. Fl. summer.

C. ánnuum, COMMON C. Cult. for the large oblong or globular and often angled dry berry (red or green), which is exceedingly pungent, and used as a condiment; leaves ovate, entire; flowers white, with truncate calyx. ①

C. cerasifórme, is cult. rarely as a pepper, more commonly for the ornamental cherry-like fruit, either bright red or yellow; stem shrubby. 2

5. PHÝSALIS, GROUND CHERRY. (Greek name for *bladdery*, from the inflated fruiting calyx.) Fl. summer.

§ 1. *Low stems* (6′ – 20′ *high*) *from slender creeping rootstocks: anthers yellow: fruiting calyx loosely inflated, 5-angled, much larger than the edible berry. All but the first are wild species of the country, in light or sandy soil.* 2

P. Alkekéngi, STRAWBERRY TOMATO. Cult. from S. Eu., and running wild E.: rather downy; leaves triangular-ovate, pointed; corolla greenish-white, 5-lobed, not spotted; fruiting calyx ovate, turning red; berry red.

P. Pennsylvánica. Smooth or somewhat hairy, but not clammy; leaves varying from ovate to lanceolate (var. LANCEOLÀTA), entire or sparingly wavy-toothed; corolla yellowish with a darker throat and slightly 5 – 10-toothed border; fruiting calyx sunken at the base; berry red.

P. viscòsa. Clammy-pubescent, much branched, bushy; leaves ovate or heart-shaped and mostly toothed; corolla light yellow with dark brown centre; fruiting calyx truncate or slightly concave at base, sharply 5-angled; berry orange or reddish, glutinous.

§ 2. *Stems* 1° – 3° *high, from an annual root: flowers small, light greenish-yellow: anthers tinged with blue or violet. Wild species in low or cult. grounds.* ①

P. pubéscens. Clammy-hairy or downy; stems much spreading; leaves ovate or heart-shaped, augulate-toothed; corolla brown-spotted in the throat; sharply 5-angled fruiting calyx loosely enclosing the yellow or greenish berry.

P. angulàta. Nearly smooth; leaves more sharply cut-toothed; peduncles slender, very small corolla not spotted; fruiting calyx 10-angled, loose, at length filled by the greenish-yellow berry.

P. Philadélphica. Almost smooth, erect; leaves ovate or oblong and oblique at base, slightly toothed or angled; corolla dark colored in the throat, over ½′ wide; fruiting calyx globose, completely filled by the large reddish or purple edible berry, and open at the mouth.

6. NICÁNDRA, APPLE-OF-PERU. (Named from the poet *Nicander?*) Only one species: fl. summer. ①

N. physaloìdes. Tall smooth weed from Peru, wild in moist waste grounds; with ovate angled or sinuate-toothed leaves, and solitary peduncles, bearing a rather large pale blue flower.

7. HYOSCÝAMUS, HENBANE. (Name of the Greek words for *hog* and *bean*.) Fl. summer. ① ②

H. niger, BLACK HENBANE, of Europe, cult. in old gardens, and a weed in waste places: clammy-downy, strong-scented, narcotic-poisonous; with clasping sinuate-toothed leaves, sessile flowers in one-sided leafy-bracted spikes, and dull yellowish corolla netted-veiny with purple.

8. ÁTROPA, BELLADONNA. (Named after one of the Fates.) ♃

A. Belladónna, the only species, sparingly cult. from Europe: low and spreading, nearly smooth, with ovate entire pointed leaves, flowers single or in pairs nodding on lateral peduncles, dull-purple corolla, and handsome purple berry; whole plant poisonous, used in medicine.

9. PETÙNIA. (*Petun* is an aboriginal name of *Tobacco*.) Cultivated as garden-annuals, from South America. The common Petunias are of the two following species and their hybrids: herbage clammy-pubescent; flowers large and showy, in summer.

P. nyctaginiflòra, with originally white corolla, the long narrow tube 3 or 4 times the length of the calyx.

P. violàcea, now much the more common, with weaker stems, and violet-purple or rose-red corolla, the broader and ventricose tube hardly twice the length of the calyx.

10. NIEREMBÉRGIA. (Named for *J. Nieremberg*, a priest and botanical collector in Buenos Ayres, whence the common species comes.) ♃ ①

N. grácilis. Cult. for ornament under many varieties, low, with slender bushy branches, small linear or spatulate-linear leaves, and scattered flowers produced all summer, white or veined or tinged with purple.

11. NICOTIÀNA, TOBACCO. (Named for *John Nicot*, one of the introducers of Tobacco into Europe.) Rank, acrid-narcotic, mostly clammy-pubescent plants, chiefly of America; leaves entire or merely wavy-margined. Fl. summer.

N. Tabácum, COMMON T., the principal species cult. for the foliage: 4° – 6° high, with lance-ovate decurrent leaves 1° – 2° long, or the upper lanceolate, panicled flowers, and rose-purple funnel-form corolla 2′ long, with somewhat inflated throat and short lobes. ①

N. rústica, a weed in some places, is a low homely plant, with ovate and petioled leaves 2′ – 5′ long, and green funnel-form corolla (1′ long) contracted under the short round lobes. ①

N. longiflòra, is slender, 2° - 3° high, cult. for its handsome white flowers, which open toward evening; corolla salver-shaped, the green tube 4′ and the lance-ovate acute lobes ½′ long; leaves lanceolate, undulate. ①

N. noctiflòra, its handsome white flowers also opening at evening (as the name denotes), is similar to last, but with ovate-lanceolate petioled leaves, tube of corolla only 2′ – 3′ long, and its roundish lobes notched at the end. ①

12. DATÙRA, THORN-APPLE, STRAMONIUM, &c. (Name altered from the Arabic.) Rank-scented, mostly large-flowered, narcotic-poisonous weeds, or some ornamental in cultivation: fl. summer.

§ 1. *Flower and the usually prickly* 4*-valved pod erect, the latter resting on a plate or saucer-shaped body which is the persistent base of the calyx, the whole upper part of which falls off entire after flowering: corolla with a* 5*-toothed border.* ①

D. Stramònium, COMMON T. or JAMESTOWN-WEED. Waste grounds: smooth, with green stems and white flowers (3′ long); leaves ovate, angled, or sinuate-toothed.

D. Tátula, PURPLE T. A weed very like the other, but rather taller, with purple stem and pale violet-purple flowers.

§ 2. *Pod nodding on the short recurved peduncle, rather fleshy, bursting irregularly, otherwise as in the foregoing section: flowers large, showy. Cult. from warm regions for ornament.* ① 4

D. Mètel. Clammy-pubescent; leaves ovate, entire or obscurely angled-toothed; corolla white, the 10-toothed border 4′ wide.

D. meteloides. Cult. from New Mexico (sometimes under the name of D. Wrightii); like the other, but pale, almost smooth, the flower sweet-scented, and the corolla with more expanded 5-toothed border 5′–6′ wide, white or pale violet.

§ 3. *Flower and smooth 2-celled pod hanging, the former very large, 6′–10′ long: calyx splitting down lengthwise after flowering. Tropical American tree-like shrubs, cult. in conservatories: flowers sometimes double.*

D. arbòrea, has ovate or lance-oblong entire or angled pubescent leaves, long teeth to the corolla, and unconnected anthers.

D. suavèolens, has mostly entire and smooth leaves, short teeth to the corolla and the anthers sticking together.

13. CÉSTRUM. (Name given by the Greeks to some different plant, the derivation obscure.) Shrubs of warm climates, chiefly American; a few cult. in conservatories.

C. élegans, or Habrothámnus élegans, from Mexico, has the branches and lower face of the ovate-lanceolate or oblong pointed leaves downy-pubescent, terminal corymbs, and rose-purple club-shaped corollas less than 1′ long.

C. noctúrnum, from W. Ind.; with smooth ovate leaves, and axillary clusters of yellowish green slender flowers, very sweet-scented at night.

C. Párqui, from Chili; has lanceolate smooth leaves very acute at both ends, and a terminal panicle of crowded spikes or racemes of tubular-funnel form or partly club-shaped dull-yellow flowers, fragrant at night.

14. LÝCIUM. (Named from the country of the original species, *Lycia.*) Trailing, climbing, or low spreading shrubs, usually spiny, with small leaves often clustered on lateral spurs, and small flowers, in spring and summer.

L. vulgàre, Matrimony Vine. From the Mediterranean region: planted, and sparingly running wild in some places, slightly thorny, with very long and lithe recurved or almost climbing branches, oblong-spatulate leaves, slender stalked flowers clustered in the axils, and pale greenish-purple 5-cleft corolla about equalling the 5 stamens.

L. Carolinièanum. Wild in salt marshes S.: low, spiny, with fleshy thickened almost club-shaped leaves, scattered small flowers, and 4-cleft purple corolla shorter than the 4 stamens.

85. GENTIANACEÆ, GENTIAN FAMILY.

Known generally from the other monopetalous plants with free ovary by the 1-celled ovary and pod with 2 parietal placentæ covered with small seeds, along with regular flowers, their stamens as many as the lobes of the corolla and alternate with them, and the leaves opposite, simple, entire, and sessile, without stipules. The exceptions are that in some cases the ovules cover the whole inner face of the ovary, and in one group the leaves are alternate and even compound. They are nearly all very smooth and bitter-tonic plants, with colorless juice, the calyx persistent. Ours herbs, none in common cultivation.

§ 1. *Leaves opposite or whorled and entire, sessile. Corolla with the lobes mostly convolute in the bud, sometimes also plaited in the sinuses.*

– *Style slender, deciduous from the pod: anthers soon curving.*

1. SABBATIA. Calyx 5–12-parted, the divisions slender. Corolla wheel-shaped, 5–12-parted. Style 2-parted. Pod globular, many-seeded. Slender herbs.

+ + Style (if any) and stigmas persistent on the pod: anthers straight.

2. FRASERA. Calyx and corolla deeply 4-parted, wheel-shaped; divisions of the latter with a glandular and fringed spot or pit on their middle. Pod oval, flattened, rather few-seeded: seeds large and flat, wing-margined. Large thick-rooted herbs, with whorled leaves and panicled flowers.

3. GENTIANA. Calyx 4–5-cleft. Corolla 4–5-lobed, often with teeth or salient folds at the sinuses, usually withering-persistent. Style short or none; stigmas 2, persistent. Pod oblong, containing innumerable small seeds with loose cellular or winged coat. Flowers solitary or clustered, mostly showy.

4. BARTONIA. Calyx 4-parted. Corolla deeply 4-cleft. Style none. Pod oblong, flattish, the minute innumerable seeds covering its whole inner face Flowers very small. Leaves reduced to little awl-shaped scales.

§ 2. *Leaves alternate, long petioled. Corolla with the lobes valvate and the edges turned inwards in the bud. Seeds many or few, with a hard or bony coat.*

5. MENYANTHES. Calyx 5-parted. Corolla very short-funnel-form, 5-lobed, white-bearded over the whole upper face. Style slender, persistent: stigma 2-lobed. Pod globular, with many smooth and shining seeds. Flowers racemed on a stout scape; one or more long petioles sheathing its base, and bearing 3 oval or oblong leaflets.

6. LIMNANTHEMUM. Calyx and corolla 5-parted; the oval divisions of the latter with a yellowish crust at their base, and in our species otherwise naked. Style short or none. Pod several-seeded. Water-plants, bearing the flowers in an umbel on the long slender petiole of the floating round-heart-shaped leaves.

1. SABBÀTIA, AMERICAN CENTAURY. (Named for *Sabbati*, an Italian botanist.) Chiefly in sandy and low or wet grounds, along the coast (with one or two exceptions): flowers white or pink, usually handsome, in summer. ① ②

* *Flowers white, 5-parted, numerous in cymes or corymbs, seldom over ½′ broad.*

S. paniculàta. Low grounds S.: stem 1°–2° high, with 4 sharp wing-like angles; leaves linear or oblong, mostly 1-nerved; lobes of the corolla little longer than the narrow-linear calyx-lobes.

S. lanceolàta. From New Jersey S.: taller, larger-flowered, with lance-ovate 3-nerved leaves, or the upper ones lanceolate and distant, acute; lobes of corolla much exceeding the thread-shaped calyx-lobes.

S. macrophýlla. Only S.: 2°–3° high, glaucous, with terete stem, thickish lance-ovate 3–5-nerved leaves, and lobes of smaller corolla very much exceeding the bristle-like calyx-lobes.

* * *Flowers rose-pink, rarely white, with yellowish or greenish eye, 5-parted, in panicled clusters, 1′ or more broad. In rather dry ground, much branched above, 1°–3° high, the only species which extend W. to Illinois, &c.*

S. brachiàta, chiefly S., has slightly angled stem, linear or narrow-oblong leaves, and fewer flowers only 1′ broad.

S. angulàris, from N. York S. & W., has wing-like angles to the stem, ovate or heart-shaped 5-nerved leaves, and corolla 1½′ broad.

* * * *Flowers rose-purple or white, 5–6-parted, 1′ or less broad, scattered singly on long peduncles: stems slender 5′–20′ high, commonly forking, scarcely angled. All grow in salt marshes or near the coast.*

S. calycòsa. Only from Virg. S.: has oblong pale leaves narrowed at base, and lance-spatulate calyx-lobes longer than the mostly white corolla.

S. stellàris. From Mass. S.: has lance-oblong leaves or the upper linear, and linear calyx-lobes shorter than the rose-purple yellowish eyed corolla.

S. grácilis. From Mass. S.: very slender, with linear or almost thread-like leaves, thread-shaped calyx-lobes as long as corolla, otherwise like preceding.

* * * * *Flowers bright rose-color or with white varieties, 7–12-parted, very handsome, 1½′–2′ broad: stems simple or sparingly branched, 1°–2° high.*

S. chloroides. Along sandy ponds, from Plymouth, Mass. S.: leaves lanceolate; peduncles 1-flowered, slender; calyx-lobes linear.

S. gentianoides. Wet barrens S.: stem-leaves linear; flowers short-peduncled or sessile, clustered.

2. FRÀSERA, AMERICAN COLUMBO. (Named for *John Fraser.*)

F. Carolinénsis. Rich wooded ground W. & S.: root very large and deep, bitter (used in medicine as a substitute for Columbo); stem 3°–8° high; leaves mostly in fours, lance-oblong, or the lowest spatulate; corolla 1′ wide, greenish-yellow or whitish, and dark-dotted. ② 2/

3. GENTIÀNA, GENTIAN. (Old name, from *Gentius*, king of Illyria.) Chiefly in woods and damp ground: flowering chiefly in autumn, a few in summer.

§ 1. *Corolla without plaits at the sinuses: anthers separate: seeds wingless.* ① ②

G. quinqueflòra. Chiefly N. & W.: branching; leaves ovate-lanceolate or slightly heart-shaped at base; flowers panicled, hardly 1′ long, the 5 lobes of the pale blue corolla triangular-ovate, bristle-pointed.

G. crinìta, FRINGED GENTIAN. Low grounds N. & W.: leaves lanceolate or broader, with rounded or heart-shaped base; flowers solitary on long peduncles terminating the stem or simple branches; calyx with 4 unequal lobes; corolla sky-blue, showy, 2′ long, funnel-form, the 4 wedge-obovate lobes with margins cut into a long and delicate fringe.

G. detónsa, takes the place of the preceding species N. W., and is perhaps a variety of it: has linear leaves and less fringe to the corolla (to which the name alludes), often none at the top of the lobes.

§ 2. *Corolla naked, 1½′–2′ long, with plaits at the sinuses, which project more or less into teeth or thin intermediate lobes: pod stalked in the corolla.* 2/

* *Stems low, bearing 1–3 slender-peduncled flowers: seeds wingless.*

G. angustifòlia. Pine barrens from N. Jersey S.: 6′–15′ high, with linear leaves, and open funnel-form azure-blue corolla 2′ long, its lobes ovate; anthers separate.

* * *Stems 1°–2° high, bearing clustered or rarely solitary 2-bracted flowers at the summit of the leafy stem, and often in the upper axils also.*

+– *Corolla between bell-shaped and short-funnel-form or obconical, mostly open, with ovate lobes exceeding the usually toothed appendages of the plaits.*

G. ochroleùca. Chiefly S. in dry ground: leaves obovate or spatulate-oblong, narrowed at the base; calyx-lobes linear; corolla greenish-white with greener and purplish stripes inside, somewhat bell-shaped; anthers separate; seeds wingless.

G. álba. Along the Alleghanies and N. W.: flowering at midsummer; leaves lance-ovate from a partly heart-shaped base, tapering thence to a point; calyx-lobes ovate, short; corolla yellowish-white, with short and broad lobes; anthers conniving; seeds broadly winged.

G. pubérula. Dry barrens and prairies W. & S.: low, roughish, or minutely pubescent, with lance-oblong, ovate, or linear rough-margined leaves only 1–2′ long; calyx-lobes lanceolate; corolla bright blue, open, its spreading ovate lobes 2 or 3 times longer than the cut-toothed intermediate appendages; seeds not covering the walls of the pod, as they do in the related species.

G. Saponària, SOAPWORT G. Low woods, chiefly N. and along the Alleghanies; leaves lance-ovate, oblong, or obovate, or in a northern variety linear, narrowed at base; calyx-lobes linear or spatulate; corolla light blue or verging to white, little open, its short and broad lobes longer than the conspicuous 2-cleft intermediate appendages; anthers conniving or united; seeds narrowly-winged.

+– +– *Corolla more club-shaped and seldom open, truncate, with no proper lobes.*

G. Andréwsii, CLOSED G. Woods especially N.: leaves lance-ovate or lance-oblong with a narrowed base; calyx-lobes ovate or oblong, short; corolla blue (rarely a white variety), its proper lobes if any shorter than the broad and more conspicuous fringe-toothed and notched appendages which terminate the folds; anthers connected; seeds broadly winged.

4. BARTÒNIA. (Named for *Prof. B. S. Barton*, of Philadelphia.) Insignificant herbs, with awl-shaped scales for leaves, and a few peduncled white flowers. ① ②

B. tenélla. Woods: 5′ – 10′ high, with branches or peduncles 1 – 3-flowered; lobes of corolla oblong, acutish; ovary 4-angled: fl. summer.

B. vérna. Bogs, only S.: smaller, less branched, 1 – few-flowered; flowers larger, in early spring; lobes of corolla spatulate, obtuse; ovary flat.

5. MENYÁNTHES, BUCKBEAN. (Name from Greek words for *month* and *flower;* application not obvious. The popular name from the leaves, somewhat resembling those of the Horsebean.)

M. trifoliàta. Cold wet bogs N.: fl. late spring; corolla white or tinged with pink; scape hardly 1° high. 2

6. LIMNÁNTHEMUM, FLOATING-HEART. (Name formed of Greek words for *swamp* and *blossom.*) But our species grow in water, and produce through the summer the small white flowers, accompanied by spur-like thick bodies, probably of the nature of roots. 2

L. lacunòsum, is common E. & S.: leaves 1′ – 2′ long, on very slender petioles, entire; lobes of corolla broadly oval; seeds smooth and even.

L. trachyspérma, in deeper water, from Maryland S.: leaves rounder, 2′ – 6′ broad, wavy-margined, roughish or dark-pitted beneath; petioles stouter; seeds roughened.

86. LOGANIACEÆ, LOGANIA FAMILY.

Known among monopetalous plants by having opposite leaves with stipules or a stipular line between their bases, along with a free ovary; the flower regular or nearly so, and stamens as many as the lobes of the corolla and alternate with them.

§ 1. *Woody twining climber, with evergreen leaves and showy flowers.*

1. GELSEMIUM. Calyx 5-parted. Corolla open funnel-form, the 5 lobes broad and imbricated in the bud. Stamens 5: anthers sagittate. Style slender: stigmas 2, each 2-parted, lobes linear, ovary 2-celled. Pod oval, flattened contrary to the partition, 2-valved, many-seeded. Seeds winged.

§ 2. *Herbs, not climbing.*

2. SPIGELIA. Calyx 5-parted, the lobes narrow. Corolla tubular and somewhat funnel-form, the 5 lobes valvate in the bud. Stamens 5: anthers linear. Style 1, slender, hairy above, jointed near the middle. Pod short, twin, 2-celled, few-seeded, when ripe separating across near the base which is left behind, and splitting 2 or 4 valves.

MITREOLA, of the South, comprises a couple of quite inconspicuous weeds, and POLYPREMUM, also S. is a common weedy plant; — both wholly insignificant, as well in the herbage as in the minute white flowers.

1. GELSÉMIUM, YELLOW JESSAMINE of the South, the name an Italian one for Jessamine, but of a different order from true Jessamine.

G. sempérvirens, our only species: low grounds from E. Virg. S., climbing trees, bearing shining lance-ovate small leaves (evergreen far S.), and a profusion of axillary clusters of bright yellow very fragrant handsome flowers (1′ or more long), in early spring.

2. SPIGÈLIA, PINK-ROOT or WORM-GRASS. (Named for *Adrian Spiegel,* latinized *Spigelius.*) Fl. summer.

S. Marilándica, Maryland P. Rich woods, from Penn. W. & S.: nearly smooth, 6′ – 18′ high; leaves sessile, lance-ovate, acute; flowers in simple or forked spike-like clusters terminating the stem or branches; corolla 1½′ long, slender, handsome, red outside, yellow within, the lobes lanceolate. Root used as a vermifuge. 2

87. APOCYNACEÆ, DOGBANE FAMILY.

Herbaceous or woody plants, known mainly by the milky acrid juice, opposite (sometimes whorled) simple and entire leaves, without stipules, and regular monopetalous flowers with 5 in the calyx, corolla, and stamens, the lobes of the corolla convolute or twisted in the bud, the anthers conniving around the stigma or often adhering somewhat to it, ordinary pollen, filaments separate, the 2 free ovaries commonly separate, but often the styles and always the stigmas united into one. The ovaries also are often united into one, the juice in several (as of Periwinkle and Oleander) is not at all or slightly milky, and one of our genera has alternate leaves. Some are ornamental in cultivation, many are acrid-poisonous. There is commonly a ring, membrane, or other appendage on the style below the stigma, to which the anthers are apt to adhere.

§ 1. *Shrubs cult. for ornament, natives of warm climates: leaves oftener whorled.*

1. ALLAMANDA. Corolla large, yellow, with short tube abruptly expanded into cylindrical bell-shaped or funnel-form, the 5 lobes broad and rounded. Stamens at the summit of the proper tube or throat, alternate and conniving with as many 2-parted narrow scales. Ovary one and 1-celled, with 2 parietal placentæ, becoming a prickly pod. Style slender. Seeds naked.
2. NERIUM. Corolla salver-form or the long tube narrow funnel-form, the throat crowned with 5 slender-toothed scales. Stamens on the middle of the tube: anthers 2-tailed at base and tapering at the apex into a long hairy twisted awn-like appendage. Style 1. Ovaries 2, forming pods. Seeds tufted.

§ 2. *More or less woody-stemmed twiners, with opposite leaves.*

3. ECHITES. Corolla funnel-form or salver-shaped, naked in the throat. Filaments very short. Style 1. Ovaries 2, becoming 2 long terete pods. Seeds with a downy tuft. Flowers large and showy.
4. FORSTERONIA. Corolla funnel-form, nearly as in Echites, but the flower small, and filaments slender.

§ 3. *Herbs or scarcely woody plants, not twiners: bark usually abounding with tough fibres · ovaries 2, becoming many-seeded pods in fruit.*

* *Leaves opposite.*

5. VINCA. Corolla salver-shaped or the tube funnel-form, the throat narrow and naked. Stamens inserted on the upper part or middle of the tube: filaments short. Style 1, slender. Pods rather short. Seeds abrupt at each end, naked, rough. The hardy species trail or creep.
6. APOCYNUM. Corolla bell-shaped, crowned with 5 triangular appendages in the throat. Stamens attached to the very base of the corolla. Style none. A large ovate stigma unites the tips of the 2 ovaries, which in fruit form long and slender pods. Seeds with a long tuft of silky down at one end. Upright or ascending herbs, with small pale or white flowers in terminal cymes or corymbs, and very tough fibrous bark.

* * *Leaves alternate, very numerous.*

7. AMSONIA. Corolla salver-shaped or the slender tube somewhat funnel-form, bearded inside, without appendages at the throat, the lobes long and linear. Stamens inserted on and included in the tube: anthers blunt at both ends. Style 1, slender. Pods long (4′ – 6′) and slender. Seeds cylindrical, abrupt at both ends, with no tuft. Upright herbs, with terminal panicled cymes of bluish flowers.

1. **ALLAMÁNDA.** (Named for *Dr. F. Allamand,* who discovered the common species in Guiana.)

A. cathártica. A showy shrub of the conservatory, with bright green oblong thinnish leaves, and golden-yellow flowers $2\frac{1}{2}' - 3'$ long.

2. NÈRIUM, OLEANDER. (The ancient Greek and Latin name.) Leaves coriaceous, rigid, closely and transversely veiny. Flowers showy, in terminal cymes, in summer, deep rose-color, or with white varieties, either single or double.

N. Oleánder, the OLEANDER of common house-culture, from the Levant: leaves lanceolate; appendage surmounting the anthers scarcely protruding; flowers large, scentless.

N. odòrum, SWEET O.: less cult., from India, more tender; leaves linear-lanceolate; appendage of the anthers protruding; flowers fragrant.

3. ECHÌTES. (Name from Greek word for *a viper.*) Plants from the warm parts of America, one not rare as a conservatory climber, viz.

E. suavèolens, or MANDEVÍLLEA SUAVEOLENS, CHILI JESSAMINE, a slender woody-stemmed tall twiner, with thin oblong or ovate heart-shaped pointed leaves, and slender peduncles bearing a few racemed very fragrant flowers, the white corolla with ample 5-lobed border, 2′ broad.

4. FORSTERÒNIA. (Named for an English botanist, *T. F. Forster.*)

F. diffórmis, in low grounds from Virginia S. & W., is a barely woody twiner, the flowering branches herbaceous and downy; leaves thin, oval-lanceolate, pointed, or sometimes linear, narrowed into a petiole; flowers ¼′ long, in cymes, greenish-yellow, all summer.

5. VÍNCA, PERIWINKLE. (Latin name, from a word meaning *to bind,* from the thread-like stems.) ♃

§ 1. TRUE PERIWINKLES, *cult. from Europe, hardy or nearly so, smooth, trailing over the ground or creeping, only the short flowering stems ascending, with blue (or by variation white) flowers solitary in the axils, in spring or early summer.*

V. mìnor, COMMON PERIWINKLE, in all country-gardens, spreading freely by the creeping sterile stems, evergreen, with ovate or oblong-ovate shining leaves barely 1½′ long, and almost truncate wedge-shaped lobes to the corolla: fl. early spring.

V. màjor, LARGE P., not quite hardy N., a variety with variegated leaves is most cultivated, larger than the first species and leaves rounder, the lobes of corolla obovate.

V. herbàcea: not evergreen; stems reclining and rooting; leaves lance-oblong, lobes of the more purple-blue corolla oblong-obovate: fl. late spring.

§ 2. *Tropical erect, somewhat woody at base: flowers produced all the season.*

V. ròsea, house and bedding plant from West Indies, with oblong-petioled veiny leaves, and showy corolla with slender tube and very narrow orifice, rose-purple, or white, with or without a pink eye.

6. APÓCYNUM, DOGBANE (to which the name in Greek refers), INDIAN HEMP, from the use made of the bark. Fl. summer. ♃

A. androsæmifòlium, SPREADING D. Along thickets, mostly N. branches forking and widely spreading; leaves ovate, petioled; corolla open bell-shaped with spreading lobes.

A. cannábinum, COMMON INDIAN HEMP. Gravelly or wet banks of streams: branches more erect; leaves oblong, lance-oblong, ovate, or slightly heart-shaped; flowers more crowded and erect; lobes of the corolla little spreading.

7. AMSÒNIA. (Named for a *Mr. Charles Amson.*) Low grounds chiefly S.; very leafy, 2° – 3° high, smooth or somewhat hairy, with rather small flowers, in late spring.

A. Tabernæmontàna. Leaves varying from ovate or lance-ovate to lanceolate, acute at each end, pale beneath.

A. ciliàta. Leaves linear or linear-lanceolate, the margins and mostly the stems beset with some scattered bristles.

88. ASCLEPIADACEÆ, MILKWEED FAMILY.

Plants with milky juice, leaves, pistils, fruits, and seeds nearly as in the preceding family; but the anthers more connected with the stigma, their pollen collected into firm waxy or granular masses (mostly 10), the short filaments (monadelphous except in the last genus) commonly bear curious appendages behind the anthers forming what is called a crown, and the corolla more commonly valvate in the bud. The flowers are rather too difficult for the beginner readily to understand throughout. For a particular study of them the Manual must be used.

§ 1. *Erect herbs, with ordinary foliage, and deeply 5-parted reflexed calyx and corolla. Flowers in simple umbels. Fruit a pair of pods (follicles,) containing numerous flat seeds furnished with a coma* (Lessons, p. 126, fig. 417) *or long tuft of soft down at one end.*

1. ASCLEPIAS. Stamens with their short filaments monadelphous in a ring or tube, bearing behind each anther a curious erect and hood-like or ear-like appendage, with a horn projecting out of the inside of it: the 5 broad anthers closely surrounding and partly adhering to the very thick stigma, a membranous appendage at their tip inflected over it. Each of the 2 cells of the anther has a firm waxy pear-shaped pollen-mass in it: and the two adjacent masses from two contiguous anthers are suspended by a stalk from a dark gland; these 5 glands, borne on the margin of the flat top of the stigma, stick to the legs, &c. of insects, and are carried off, each gland taking with it 2 pollen masses, the whole somewhat resembling a pair of saddle-bags.
2. ACERATES. Like Asclepias, but no horn in the hoods or ear-like appendages, and the flowers always greenish.

§ 2. *Twining plants with ordinary foliage; pods and seeds nearly as in Asclepias.*

* *Anthers with their hanging pollen-masses nearly as Asclepias: pods smooth and even.*

3. ENSLENIA. Calyx and corolla 5-parted, the divisions lance-ovate and nearly erect. The 5 appendages of the filaments are in the form of membranaceous leaflets, each bearing a pair of awns on their truncate tip. Herb.
4. VINCETOXICUM. Corolla 5-parted, wheel-shaped. A flat and fleshy 5–10-lobed disk or crown in place of the hoods of Asclepias. Herbs.

* * *The 10 pollen-masses horizontal, fixed in pairs to 5 glands of the stigma.*

5. GONOLOBUS. Corolla wheel-shaped: a fleshy and wary-lobed ring or crown in its throat.

* * * *The 10 short pollen-masses fixed by their base in pairs to the 5 glands of the stigma, and erect. Shrubby plants, of tropical regions.*

6. HOYA. Corolla wheel-shaped, 5-lobed, thick and wax-like in appearance. Crown of 5 thick and depressed fleshy appendages radiating from the central column.
7. STEPHANOTIS. Corolla salver-shaped, the tube including the stamens, crown, &c., in its somewhat swollen base, the 5 ovate lobes convolute in the bud. Crown of 5 thin erect appendages. Stigma conical.

* * * * *Anthers distinct, the 5 pollen-masses each composed of 4 small granular masses united, and applied directly to the glands of the stigma without any stalk. Shrubby twiners.*

8. PERIPLOCA. Corolla 5-parted, wheel-shaped, the divisions hairy on the upper face: alternate with them are 5 small thick scales, each bearing a bristle-shaped appendage. Filaments distinct, bearing anthers of more ordinary appearance than in the rest of this family. Stigma hemispherical. Pods smooth.

§ 3. *Fleshy low plants, Cactus-like, with only small fleshy scales or teeth in place of leaves, on the angles of the thickened stems or branches.*

9. STAPELIA. Flowers large, lurid, solitary, lateral. Calyx 5-parted. Corolla 5-cleft, wheel-shaped: within is a crown formed of two rings of short appendages or lobes. Masses of waxy pollen 10, erect.

1. ASCLÈPIAS, MILKWEED, SILKWEED. (The Greek name of *Æsculapias*, father of medicine.) Flowering in summer. 2/

* *Flowers bright orange or red: pods smooth: leaves opposite, except in the first.*

A. tuberòsa, BUTTERFLY-WEED, PLEURISY ROOT. Dry hills: milky juice hardly any; stems and mostly scattered linear or lance-oblong leaves hairy; flowers bright orange.

A. Curassávica. Wild far S., cult. from S. America, as a house and bedding plant; nearly smooth; leaves lanceolate; umbels long-peduncled; corolla scarlet-red, the hoods orange.

A. paupércula. Wet barrens from N Jersey S.: tall, smooth, with long lance-linear leaves, one or more few-flowered umbels raised on long peduncle, and red corolla with bright orange hoods.

A. rùbra. Low barrens from N. Jersey S.: smooth, with lance-ovate gradually taper-pointed leaves, a few many-flowered umbels on a long naked peduncle, and purple-red flowers.

* * *Flowers pink or light rose-purple: leaves all opposite: pods smooth.*

A. incarnàta, SWAMP MILKWEED. Wet grounds, with very leafy branching stems, lanceolate or lance-oblong acute leaves, often slightly heart-shaped at the base; smooth or smoothish, or in var. PÚLCHRA pubescent and the leaves very short-petioled.

* * * *Flowers dull purplish, greenish, or white.*

+ *Stems branching, almost woody at base: leaves all opposite: pods smooth.*

A. perénnis. Low grounds S.: nearly smooth; leaves lanceolate or lance-ovate, slender-petioled; flowers small, white; seeds mostly without a tuft!

+ + *Stem simple: leaves all opposite and closely sessile or clasping by a heart-shaped base, the apex rounded or notched: plants smooth, pale or glaucous.*

A. obtusifòlia. Sandy grounds, 2° – 3° high, the rather remote broadly oblong leaves wavy; umbel mostly solitary, long-peduncled; flowers pretty large, greenish-purplish.

A. amplexicaùlis. Dry barrens S.: stems reclining, 1° – 2° high, very leafy; leaves ovate-heart-shaped; umbels several, short-peduncled; corolla ash-colored, the hoods white.

+ + + *Stem simple or nearly so, leafy to the top: leaves all opposite, ovate, oval, or oblong, pretty large, short-petioled: umbels lateral and terminal: flowers ½′ long or nearly so.*

++ *Pods beset with soft prickle-shaped or warty projections.*

A. Cornùti, COMMON MILKWEED of fields and low grounds N.: downy, or the large pale leaves soon smooth above; flowers dull greenish-purplish.

++ ++ *Pods even, but usually minutely downy.*

A. phytolaccoìdes, POKE-MILKWEED. Moist grounds N. & W.: smooth or smoothish, 3° – 5° high; leaves large, pointed or acute at both ends; umbels loose, the long pedicels (1′ – 3′) equalling the peduncle; corolla greenish, but the more conspicuous hoods white.

A. purpuráscens. Rich ground N. & W.: 1° – 3° high; leaves downy beneath, smooth above, the upper taper-pointed; pedicels of the rather loose umbel shorter than the peduncle; corolla dark dull purple.

A. variegàta. Dry grounds, commoner S. & W.: 1° – 2° high, nearly smooth; leaves oval or obovate, slightly wavy; peduncle and crowded pedicels short and downy; corolla white, the hoods purplish.

+ + + + *Stems simple or rarely branched, slender: leaves most of them in whorls: pods slender and smooth: flowers small, white or whitish.*

A. quadrifòlia, FOUR-LEAVED M. Rocky woods mostly N.: stems 1° – 2° high, nearly smooth, naked below, bearing about the middle one or two whorls of 4 ovate or lance-ovate taper-pointed petioled leaves, and beneath or above them usually a pair of smaller ones; pedicels slender; corolla mostly tinged with pink, the hoods white.

A. verticillàta, WHORLED M. Dry ground, 1° – 2° high, smoothish; stems very leafy throughout; leaves very narrow linear or thread-shaped, in whorls of 3 – 6; flowers greenish-white.

2. ACERÀTES, GREEN MILKWEED. (Name from the Greek, means *without a horn*, i. e. none to the hood-like appendages, in which it differs from Asclepias.) Flowers green or greenish, in summer. 2

§ 1. *Flowers in compact lateral umbels: corolla with oblong reflexed divisions: the hoods erect: pods slender, sometimes downy, but with the surface even.*

A. viridiflòra. Dry sandy or gravelly soil: soft-downy or smoothish, 1° – 2° high; leaves varying from oval to linear, mostly opposite; globular umbels nearly sessile; flowers short-pedicelled, nearly ½′ long when open; hoods not elevated above the base of the corolla.

A. longifòlia. Low barrens W. & S.: rather hairy or roughish, 1° – 3° high, with very numerous mostly alternate linear leaves, flowers smaller and on slender pedicels, the umbel peduncled, hoods elevated on a short ring of filaments above the base of the corolla.

§ 2. *Flowers in loose terminal and solitary or corymbed umbels: divisions of the corolla barely spreading, but the large hoods spreading and slipper-shaped: pods thick, often with some soft tubercle-like projections.*

A. paniculàta. Dry prairies and barrens from Ill. S. & W.: smoothish, 1° high; leaves alternate, oblong or lance-oblong; flowers 1′ broad, green, the hoods purplish.

3. ENSLÉNIA. (Named for *A. Enslen*, an Austrian traveller.) 2

E. álbida. River-banks from Ohio S. & W.: climbing, 8° – 12°; smooth, with opposite heart-ovate long-petioled leaves, and small whitish flowers in raceme-like clusters on axillary peduncles, all late summer.

4. VINCETÓXICUM. (Name is equivalent to *Poison Periwinkle.*) 2

V. nìgrum, from Eu.: a low-twining smooth weed, escaping from gardens E.; leaves ovate and lance-ovate; flowers small, brown-purple, rather few in axillary umbels, in summer.

5. GONÓLOBUS. (Name in Greek means *angled pod.*) Ours are twining herbs, along river-banks, chiefly S., with opposite heart-shaped petioled leaves, and corymbs or umbels of dark or dull-colored small flowers, on peduncles between the petioles, in summer. 2

G. lævis. From Virg. to Illinois S.: smooth or only sparingly hairy, the yellowish-green flowers and the longitudinally ribbed pods smooth.

G. obliquus. From Penn. S.: hairy, somewhat clammy; flowers minutely downy outside, long and narrow in the bud, dull crimson-purple within, the strap-shaped or lanceolate divisions ½′ long; pods ribless, warty.

G. hirsùtus. From Virginia S.: differs from the last in its short-ovate flower-buds, the oval or oblong divisions of corolla only about ¼′ long.

6. HÓYA, WAX-PLANT. (Named for *T. Hoy*, an English florist.)

H. carnòsa, a well-known house-plant from India; with rooting stems, thick and fleshy oval leaves, umbels of numerous flesh-colored or almost white flowers, the upper surface of corolla clothed with minute papillæ.

7. STEPHANÒTIS. (Name from Greek for *crown* and *ear*, referring to the appendages of the stamens.)

S. floribúnda, from Madagascar: a fine hot-house twiner, very smooth, with opposite oval or oblong thickish leaves, and lateral umbels of very showy fragrant flowers, the pure white corolla 1½′ in diameter, the tube 1′ long.

8. PERÍPLOCA. (Name, a Greek word, implies that the plant twines.)

P. Grèca, of S. Eu., cult. as an ornamental twiner, hardy through the Middle States: smooth, with opposite ovate mostly pointed leaves, on short petioles, and lateral cymes of rather small flowers, the corolla greenish-yellow with the upper face of the oblong lobes brownish-purple: in summer.

9. STAPÈLIA. (Named for a Dutch naturalist, *Dr. Van Stapel.*) Strange-looking fleshy plants of the Cape of Good Hope, cult. in conservatories along with Cactuses. The commonest is

S. hirsùta. Stems or branches 6′–10′ high, with concave sides, pale and obscurely downy; flower 3′–4′ in diameter, dull purple and yellowish with darker transverse stripes, beset with purple very long hairs, and with denser hairiness towards the centre, exhaling a most disgusting odor, not unlike that of putrid meat.

89. OLEACEÆ, OLIVE FAMILY.

Trees or shrubs, chiefly smooth, without milky juice, distinguished among monopetalous plants with free ovary by the regular flowers having stamens almost always 2, and always fewer than the 4 (sometimes 5 or more) divisions of the corolla, the ovary 2-celled and (except in Jasminum and Forsythia) with one pair of ovules in each cell: style if any only one, rarely 2-cleft. A few are nearly or quite polypetalous; others apetalous.

§ 1. *Calyx and corolla with* 5 - 8 *lobes A single erect ovule and seed in each cell.*

1. JASMINUM. Corolla salver-shaped, the lobes convolute in the bud. Stamens 2, included in the tube. Ovary and the berry-like fruit 2-lobed, 2-seeded.

§ 2. *Calyx and corolla with the parts in fours, or sometimes* (in Fraxinus) *one or both wanting. Ovules hanging, usually a pair in each cell, many in No.* 2. *Leaves opposite, except accidentally.*

* *Leaves simple: flowers perfect and complete.*

+ *Ovules and seeds numerous or several in each cell of the ovary and pod.*

2. FORSYTHIA. Corolla golden yellow, bell-shaped, 4-lobed, the lobes convolute in the bud. The 2 stamens and style short. Pod ovate. Leaves deciduous.

+ + *Ovules a pair in each cell, but the seeds often fewer.*

3. SYRINGA. Corolla salver-form, the lobes valvate in the bud, the tube much longer than the 4-toothed calyx. Fruit a pod, 4-seeded, flattened contrary to the narrow partition, 2-valved, the valves almost conduplicate. Seeds slightly wing-margined. Leaves deciduous.
4. LIGUSTRUM. Corolla short funnel-form, with spreading ovate obtuse lobes, valvate in the bud, white. Fruit a 1–4-seeded black berry. Leaves firm and thickish, but deciduous.
5. OLEA. Corolla short, bell-shaped, or deeply cleft into 4 spreading lobes, white. Fruit a drupe, the hard stone often becoming 1-celled and 1-seeded. Leaves evergreen.
6. CHIONANTHUS. Corolla white, 4-parted, or of 4 very long and narrow linear petals slightly or scarcely united at their base; to which the 2 (rarely 3 or even 4 in cultivation) very short stamens barely adhere. Fruit a fleshy and globular drupe, the stone becoming 1-celled and commonly 1-seeded. Leaves deciduous.

* * *Leaves pinnate: flowers polygamous or diœcious, in most species apetalous.*

7. FRAXINUS. Calyx small, sometimes obsolete or wholly wanting. Petals 4, 2, or none. Anthers large. Fruit a simple samara or key (Lessons, p. 122. fig. 389), usually becoming 1-celled and 1-seeded. Leaves deciduous.

1. JÁSMINUM, JESSAMINE. (From the Arabic name.) Cultivated for ornament, from the Old World, all tender and house-plants except at the South. Flowers fragrant.

* *Flowers yellow: leaves commonly alternate and compound.*

J. odoratíssimum, COMMON SWEET YELLOW J., from Madeira: smooth, twining; leaflets 3 or 5, ovate; peduncles terminal, few-flowered.

J. revolùtum, from Himalayas or China: not twining, has mostly 3 – 7 leaflets, and more numerous and fragrant flowers, 1½′ wide.

* * *Flowers white: leaves opposite.*

J. officinàle, COMMON WHITE J., from the East, has striate-angled branches scarcely twining, about 7 oblong or lance-ovate leaflets, a terminal cyme of very fragrant flowers and calyx-teeth slender.

J. grandiflòrum, from India, has 7 or 9 oval leaflets, the uppermost confluent, larger and fewer flowers than the foregoing, reddish outside.

J. Azóricum, from the Azores and Madeira: not twining, with 3 ovate or heart-shaped leaflets, terminal cymes of very sweet-scented flowers, and very short calyx-teeth.

J. Sámbac, from Tropical India: scarcely climbing, pubescent; leaves simple, ovate, or heart-shaped; flowers in small close clusters; calyx-teeth about 8, slender, the rounded lobes of the corolla as many; flowers simple or double, very fragrant, especially at evening.

2. FORSÝTHIA. (Named for *W. A. Forsyth*, an English botanist.) Ornamental shrubs, from China and Japan, with flowers from separate lateral buds, preceding the serrate leaves, in early spring.

F. viridíssima, a vigorous shrub, with strong and mostly erect yellowish green branches, covered in early spring with abundant showy yellow flowers, followed by the deep green lance-oblong leaves.

F. suspénsa, shrub with long and slender weak branches hanging, or some of them creeping, to be treated as a climber; flowers still earlier, but less profuse; leaves thinner, duller, ovate.

3. SYRÍNGA, LILAC. (From Greek word for *tube*, alluding either to the tubular corolla or to the twigs, used for pipe-stems.) Familiar ornamental tall shrubs, from the Old World, with scaly buds in the axils of the leaves, but hardly ever a terminal one (so that there is only a pair at the tip of a branch), entire leaves on slender petioles, and crowded compound panicles or thyrsus of mostly fragrant flowers, in spring.

S. vulgàris, COMMON L., from E. Europe or Persia: with ovate and more or less heart-shaped leaves, and lobes of corolla moderately spreading; fl. lilac or pale violet, and a white variety.

S. Pérsica, PERSIAN L.; more slender, with lance-ovate leaves, and looser clusters of lilac-purple or paler or sometimes white flowers, border of the corolla flat when open.

4. LIGÚSTRUM, PRIVET or PRIM. (Classical Latin name.) Shrubs of Old World, planted for ornament, with short-petioled entire leaves and panicles of small flowers, in early summer.

L. vulgàre, COMMON P., of Europe, here planted for hedges, and running wild E.; leaves small, lance-ovate or lance-oblong.

L. Japónicum. Cult. from Japan, not hardy N.: has long and widely spreading branches, larger ovate leaves, and larger flowers in ample panicles.

5. ÒLEA, OLIVE. (The classical Latin name.) Flowers small, and in small panicles or corymbs, in spring.

O. Europæa, OLIVE of the Levant, sometimes planted far S.: tree with lanceolate or lance-oblong pale entire leaves, whitish-scurfy beneath, and oblong edible oily fruit.

O. Americàna, Devil-wood. Wild along the coast from Virginia S.: small tree, with lance-oblong and entire very smooth green leaves (3′ – 6′ long), and spherical fruit.

O. fràgrans, or Osmánthus fragrans, of Japan and China (differing from Olive genus in the almost 4-parted corolla and 2-parted style), cult. in green-houses for the exquisite fragrance of its very small flowers; the leaves oblong or oval, sharply serrate, bright green, very smooth.

6. CHIONÁNTHUS, Fringe-Tree. (Name of the Greek words for *snow* and *blossom,* from the very light and loose panicles of drooping snow-white flowers.)

C. Virgínica, Common F. River-banks from Penn. S., and planted for ornament: shrub or low tree, with entire oval or obovate leaves (3′ – 5′ long), the lower surface often rather downy, loose panicles of flowers in late spring or early summer, petals 1′ long, and fruit blue-purple with a bloom.

7. FRÁXINUS, ASH. (Classical Latin name.) Timber-trees, with light and tough wood, dark-colored buds, and small insignificant flowers appearing in spring with or rather before the leaves of the season, from separate buds in the axils of the leaves of the preceding year.

§ 1. European Ashes, *planted as shade trees, &c.: flowers polygamous.*

F. Órnus, Flowering Ash, of S. Europe, the tree which furnishes *manna,* not hardy N., sometimes planted S.: this and a species like it in California have 4 petals, either distinct or slightly united, or sometimes only 2, narrow, greenish; leaflets 5 – 9, lanceolate or oblong, small.

F. excélsior, English or European Ash. Hardy fine tree, with bright green lance-oblong leaflets nearly sessile and serrate; petals none and calyx hardly any; fruit flat, linear-oblong. The Weeping Ash is a variety or sport of this.

§ 2. American Ashes, *all destitute of petals, and diœcious or mostly so.*

* *Fruit terete at the base, winged from the other end: calyx minute, persistent: leaflets 7 – 9, or sometimes 5, stalked, either sparingly toothed or entire.*

F. Americàna, White Ash. Large forest tree of low grounds, furnishing valuable timber; with ash-gray branches, smooth stalks, ovate or lance-oblong pointed leaflets either pale or downy beneath; and rather short fruit with a terete marginless body and a lanceolate or wedge-linear wing.

F. pubéscens, Red Ash. Common E. & S.; known by its velvety-pubescent young shoots and leafstalks, and fruit with its flattish 2-edged seed-bearing body acute at the base, the edges gradually dilated into the lance-linear or oblanceolate wing.

F. víridis, Green Ash. Like the last, into which it seems to pass, but is smooth, with leaves bright green on both sides: a smaller tree, most common W. & S.

* * *Fruit flat and winged all round: leaflets mostly green both sides and serrate.*

F. sambucifòlia, Black Ash. Small tree in swamps, N. & N. W., with tough wood separable in layers, used for hoops and coarse baskets; the bruised leaves with the scent of Elder: smooth; leaflets 7 – 11, sessile on the main stalk, oblong-lanceolate tapering to a point; calyx none, at least in the fertile flowers; fruits linear-oblong.

F. quadrangulàta, Blue Ash. Large forest tree W., yielding valuable wood; with square branchlets, 5 – 9 ovate veiny leaflets on short stalks, and narrowly oblong fruits.

F. platycárpa, Carolina Water-Ash. River swamps S.: small tree, with terete branchlets, 5 – 7 ovate or oblong short-stalked leaflets acute at both ends, and broadly winged (sometimes 3-winged) fruits, oblong with a tapering base.

III. APETALOUS DIVISION. Includes the orders with flowers destitute of corolla; some are destitute of calyx also.

90. ARISTOLOCHICAEÆ, BIRTHWORT FAMILY.

Known from all other apetalous orders by the numerous ovules and seeds in a 6-celled ovary, to which the lower part of the calyx is adherent, the latter mostly 3-lobed, the stamens generally 6 or 12. Anthers adnate and turned outwards. Calyx dull-colored, valvate in the bud. Leaves petioled, usually heart-shaped, not serrate. Flowers solitary, perfect, commonly large. Bitter, tonic or stimulant, sometimes aromatic plants.

1. ASARUM. Low stemless herbs, with one or two leaves on long petioles, and a flower at the end of a creeping aromatic rootstock, the flowers therefore close to the ground. Calyx regular, with 3 equal lobes. Stamens 12, distinct, borne on the apex of the ovary or the base of the stout style, usually pointed beyond the anther. Seeds large, thickish, in a rather fleshy and irregularly bursting pod.
2. ARISTOLOCHIA. Leafy-stemmed herbs or woody twiners. Calyx tubular variously irregular, often curved. Filaments none: anthers adherent directly and by their whole inner face to the outside of the 3 - 6-lobed stigma. Seeds very flat, in a dry 6-valved pod.

1. ÁSARUM, ASARABACCA, WILD GINGER. (Ancient name, of obscure derivation.) On hillsides in rich woods: fl. spring. ♃

§ 1. *Filaments slender, much longer than the short anthers: style* 1, *thick, bearing* 6 *thick stigmas: leaves a single pair with a peduncle between them.*

A. Canadénse, Canada Wild Ginger, sometimes called Snakeroot. Common N.: soft-pubescent; leaves broadly heart-shaped or kidney-shaped, not evergreen; calyx bell-shaped but cleft down to the adherent ovary, brown-purple inside, the abruptly spreading lobes pointed.

§ 2. *Filaments short or almost none: anthers oblong-linear: styles* 6, *each* 2-*cleft, bearing the stigma below the cleft: leaves thick and evergreen, smooth, often mottled, usually only one each year: rootstocks in a close cluster.*

A. Virgínicum, Virginia W. Along the Alleghanies S.: leaves small, rounded heart-shaped; calyx tubular-bell-shaped with a somewhat narrowed throat and broad short lobes, the base coherent only with base of the ovary.

A. arifòlium, from Virginia S., has larger somewhat halberd-shaped leaves, and very short and blunt lobes to the calyx.

2. ARISTOLÒCHIA, BIRTHWORT. (Ancient name, from medicinal properties.) Cells of the anthers in our species 4 in a horizontal row under each of the 3 lobes of the stigma, i. e. two contiguous 2-celled anthers in each set, or 6 in all. Flowers in and above the axils.

A. Serpentària, Virginia Snakeroot (used in medicine). Rich woods, chiefly in Middle States and S.: low downy herb; stems clustered about 1° high; leaves ovate or oblong and heart-shaped, sometimes halberd-form, acute; flowers all next the root, curved like the letter S, contracted in the middle and at the throat, in summer. ♃

A. Sìpho, Pipe-Vine, Dutchman's Pipe (from the shape of the curved calyx). Rich woods from Penn. along the mountains S. and planted for arbors very tall-climbing woody twiner, smooth, but the rounded heart-shaped leaves often downy beneath, these becoming 8′ – 12′ broad; peduncles with a clasping bract, drooping; calyx 1½′ long, inflated above the ovary, narrowing above, contracted at the throat, the flat border brown-purple and obscurely 3-lobed: fl. late spring.

A. tomentòsa. Common S.: a more slender woody climber, with smaller rounder and very veiny downy leaves, and yellowish flower with an oblique almost closed brownish orifice, the border reflexed: fl. late spring or summer.

91. NYCTAGINACEÆ, FOUR-O'CLOCK FAMILY.

Represented by a few plants with tubular or funnel-form calyx colored like a corolla, and falling away from a persistent lower portion which closes completely over the 1-celled 1-ovuled ovary and seed-like fruit, forming a hard and dry covering which would be mistaken for a true pericarp. Stamens 2 – 5, the long slender filaments hypogynous, but apt to adhere somewhat to the sides of the calyx-tube above. Embryo coiled around some mealy albumen. (Lessons, p. 23, fig. 52 – 55.) Ours are herbs, with opposite simple entire or wavy leaves, and jointed stems, tunid at the joints.

1. ABRONIA. Flowers small, many in a peduncled umbel-like head surrounded by an involucre of about 5 separate bracts. Calyx salver-shaped with a slender tube, and a corolla-like 5-lobed border, which is plaited in the bud, the lobes generally notched at the end. Stamens 5 and style included.
2. OXYBAPHUS. Flowers small, a few together surrounded by a 5-lobed involucre, which enlarges and becomes thin, membranaceous, reticulated, and wheel-shaped after flowering. Calyx with a very short tube constricted above the ovary, expanding into a bell-shaped 5-lobed corolla-like border, open only for a day. Stamens (mostly 3) and slender style protruding. Fruit (persistent base of calyx) akene-like, strongly-ribbed.
3. MIRABILIS. Flower large, in the common species only a single one in the cup-shaped 5-cleft green involucre, which thus exactly imitates a calyx, as the tubular funnel-shaped or almost salver-shaped delicate calyx does a corolla. Stamens 5, and especially the style (tipped with a shield-shaped stigma) protruded. Fruit ovoid, smooth and nearly even.

1. ABRÒNIA. (Name from Greek word meaning *delicate.*) Western North American herbs, cultivated for ornament: fl all summer. ♃

A. umbellàta, from coast of California, has prostrate slender stems, ovate-oblong slender petioled leaves, and rose-purple flowers open by day, the involucre of small bracts.

A. fràgrans, from Rocky Mountains, hardy N., has ascending branching stems, lance-ovate leaves, and white sweet-scented flowers opening at sunset; the involucre of conspicuous ovate scarious and whitish bracts.

2. OXÝBAPHUS. (Name from a Greek word for a *vinegar-saucer,* from the shape of the involucre.) ♃ Several species on Western plains: fl. rose-purple, all summer.

O. nyctagíneus. Rocky or gravelly soil from Wisconsin W. & S.: smooth or smoothish; leaves petioled, varying from ovate to lanceolate, obtuse or heart-shaped at base.

O. álbidus. From North Carolina S.: often hairy above; leaves sessile or nearly so, acute at base, lanceolate or oblong; fruit more hairy.

3. MIRÁBILIS, FOUR-O'CLOCK or MARVEL-OF-PERU. (Clusius called it *Admirabilis,* which Linnæus shortened.) Natives of warm parts of America: roots very large and fleshy; leaves more or less heart-shaped, the lower petioled; flowers mostly clustered, showy, opening towards sunset or in cloudy weather, produced all summer. ♃

M. Jalápa. Cult. for ornament in many varieties as to flower (red, yellow, white, or variegated), its tube only 2′ long and thickish, stamens shorter than its spreading border; whole plant nearly smooth.

M. longiflòra. Less common in cult.; tube of the sweet-scented flower 6′ long and clammy-hairy (as well as the upper leaves); stamens shorter than its spreading white border.

M. Wrightiàna. Texas and cult.: more slender than the last, nearly smooth, tube of the smaller and more slender faintly fragrant flower 4′ long, the border white tinged with rose; stamens and style much protruding.

92. PHYTOLACCACEÆ, POKEWEED FAMILY.

A small family, represented here only by a single species of the principal genus,

1. **PHYTOLÁCCA,** POKE or POKEWEED. (A mongrel name, of the Greek word for *plant* prefixed to the French *lac*, lake, alluding to the crimson coloring-matter of the berries.) Calyx of 5 rounded petal-like white sepals. Stamens 5 – 30. Ovary of several cells and lobes, bearing as many short styles, in fruit a depressed juicy berry, containing a ring of vertical seeds ; these formed on the plan of those of the next family. ♃

P. decándra, COMMON P. or SCOKE, GARGET, &c. Coarse smooth weed of low grounds, with large acrid-poisonous root, stout stems 6° – 9° high, alternate ovate-oblong leaves on long petioles, and racemes becoming lateral opposite a leaf, in summer, ripening the dark crimson purple berries in autumn ; stamens, styles, and seeds 10.

93. CHENOPODIACEÆ, GOOSEFOOT FAMILY.

Represented chiefly by homely herbs, with inconspicuous greenish flowers ; the 1-celled ovary has a single ovule and ripens into an akene or utricle, containing a single seed, usually with embryo coiled more or less around mealy albumen. Leaves chiefly alternate. Plants neither attractive nor easy to students ; only the cultivated plants and commonest weeds here given.

§ 1. *Cultivated for ornament, twining plant, with white flowers : calyx corolla-like.*

1. BOUSSINGAULTIA. Flowers in slender spikes from the axils of the leaves, perfect. Calyx 6-parted, spreading, and with one or two exterior sepals or bracts. Stamens 6, with slender filaments. Style slender: stigmas 3, club-shaped. Fruit a thin akene, pointed with the persistent style.

§ 2. *Cultivated for food, from Eu. : flowers greenish, as is usual in the family.*

2. BETA. Flowers perfect, clustered, with 3 bracts and a 5-cleft calyx becoming indurated in fruit, enclosing the hard akene, the bases of the two coherent. Stamens 5. Style short: stigmas mostly 2. Seed horizontal.
3. SPINACIA. Flowers dicœcious, in axillary close clusters; the staminate ones racemed or spiked, consisting of a 4 – 5-lobed calyx and as many stamens. Pistillate flowers with a tubular calyx which is 2 – 3-toothed at the apex and 2 – 3-horned on the sides, hardening and enclosing the akene. Styles 4. Seed vertical.

§ 3. *Weeds of cultivation, or of roadsides, fields, &c. Flowers perfect, bractless.*

4. BLITUM. Flowers in close axillary clusters or heads, which are sometimes confluent into interrupted spikes. Calyx 2 – 5-parted, becoming fleshy or berry-like in fruit in the genuine species. Stamens 1 – 5. Styles or stigmas 2. Seed vertical in the calyx.
5. CHENOPODIUM. Flowers in small clusters collected in spiked or sometimes open panicles. Calyx mostly 5-cleft, not succulent in fruit. Ovary and utricle depressed. (Lessons, p. 121, fig. 386.) Styles 2, rarely 3. Seed horizontal, or in a few species occasionally vertical.

The following also are common species along the coast or near salt-water : —

Átriplex pátula, and one or two other species of ORACHE : most like Spinacia, but scurfy or mealy.

Salicórnia herbácea, and two other species of GLASSWORT : low, leafless, fleshy, jointed, branching plants, with the flowers sunken in the fleshy spikes.

Suæda marítima, SEA BLITE : with branching stems, and small flowers in the axils of linear nearly terete fleshy leaves.

Sálsola Kàli, SALTWORT : bushy-branching annual, with awl-shaped

prickly pointed leaves, and flesh-colored horizontal wings on the back of the fruiting calyx, making a circular broad border.

1. BOUSSINGAÚLTIA. (Named for the traveller and agricultural chemist, *Boussingault.*)

B. baselloìdes, of South America: high twining plant, in cultivation herbaceous, from oblong tubers resembling small potatoes: smooth, with somewhat heart-shaped succulent leaves, and slender racemes of deliciously fragrant small flowers in autumn. ♃

2. BÈTA, BEET. (Latin name.) One species in cultivation, viz.: —

B. vulgàris, COMMON BEET, from S. Eu.: cult in many varieties, with ovate-oblong smooth often wavy-margined leaves, sometimes purple-tinged; flower-clusters spiked; root conical or spindle-shaped. MANGEL WURTZEL or SCARCITY-ROOT is a mere variety, the root used for feeding cattle. ②

3. SPINÀCIA, SPINACH. (Name from Latin for *spine* or *thorn;* probably from the horns or projections on the fruiting-calyx which become rather spiny in one variety.)

S. oleràcea, COMMON SPINACH, cult. from the Orient, as a pot-herb; the soft-fleshy leaves triangular or ovate and petioled. ① ②

4. BLÌTUM, BLITE. (Ancient Greek and Latin name of some pot-herb or of the Amaranth.) Fl. summer.

B. capitàtum, STRAWBERRY BLITE, the flower-heads as the fruit matures becoming bright red and juicy, like strawberries; leaves triangular and halberd-shaped, wavy-toothed, smooth and bright green. Dry banks, margins of woods, &c. N., sometimes in gardens. ② ①

B. Bonus-Henrìcus, GOOD-KING-HENRY, cult. in some old gardens, is between a Blite and a Goosefoot, being slightly mealy, as in the latter, and the calyx not fleshy nor fully enclosing the fruit, but the seed is vertical; leaves triangular and partly halberd-shaped; flower-clusters crowded in an interrupted terminal spike. ♃

5. CHENOPÒDIUM, GOOSEFOOT (which the name denotes in Greek), PIGWEED, &c. Weeds: fl. late summer and autumn.

§ 1. *Either smooth or with scurfy mealiness, insipid, never hairy nor aromatic.* ①

C. álbum, WHITE G. or LAMB'S-QUARTERS; the commonest species in all cult. ground: pale, more or less mealy, with leaves varying from rhombic-ovate to lanceolate, either angled-toothed or entire, and flower-clusters in dense panicled spikes. Var. BOSCIÀNUM, wild in shady places, mostly S., has loose branches, obscure mealiness, and smaller loosely clustered flowers.

C. úrbicum, in waste grounds, is dull green, scarcely mealy, the triangular leaves coarsely and sharply many-toothed, flower-clusters in dense panicled spikes, and seed with rounded margins.

C. hýbridum, MAPLE-LEAVED G. Waste grounds, unpleasantly scented like Stramonium, bright green throughout; the widely branching stem 2° – 4° high; the thin large leaves triangular and heart-shaped, sinuate and angled, the angles extended into a few taper-pointed coarse teeth; racemes in loose and leafless panicles; seed sharp-edged.

§ 2. *Not mealy or scurfy, but minutely glandular or pubescent, aromatic-scented: the seed sometimes vertical.* ① ②

C. Bòtrys, JERUSALEM OAK or FEATHER GERANIUM. Gardens and some roadsides: low, spreading, almost clammy-pubescent, sweet-scented; leaves sinuate-pinnatifid, slender-petioled; racemes loosely corymbed.

C. ambrosioìdes, MEXICAN TEA, WORMSEED. Waste grounds, especially S.: rather stout, smoothish, strong-scented; leaves oblong or lanceolate, varying from entire to cut-pinnatifid, nearly sessile; spikes dense, leafy or leafless. This, especially the more cut-leaved var. ANTHELMÍNTICUM, is used as a vermifuge, and yields the *wormseed-oil.*

94. AMARANTACEÆ, AMARANTH FAMILY.

Weeds and some ornamental plants, chiefly herbs, essentially like the foregoing family, but the flowers provided with dry and mostly scarious crowded persistent bracts, and the fruit sometimes several-seeded. The cultivated sorts are ornamental, like Immortelles, on account of their colored dry bracts which do not wither.

§ 1. *Leaves alternate, mostly long-petioled: anthers 2-celled.*

1. AMARANTUS. Flowers monœcious or polygamous, each with 3 bracts Calyx of 5, or sometimes 3, equal erect sepals, smooth. Stamens 5, sometimes 2 or 3. Stigmas 2 or 3. Ovule solitary, on a stalk from the base of the ovary. Fruit an utricle, 2–3-pointed at apex, usually opening all round transversely, the upper part falling off as a lid (Lessons, p. 121, fig. 387), discharging the seed. Flowers in axillary or terminal spiked clusters.
2. CELOSIA. Flowers perfect. Ovules and seeds numerous. Otherwise nearly as Amarantus, but the crowded spikes imbricated with shining colored bracts. In cultivation the spikes are often changed into broad crests.

§ 2. *Leaves opposite: anthers 1-celled.*

3. GOMPHRENA. Flowers perfect, chiefly in terminal round heads, crowded with the firm colored bracts. Calyx 5-parted or of 5 sepals. Stamens 5, monadelphous below: filaments broad, 3-cleft at summit, the middle lobe bearing a 1-celled anther (Lessons, p. 102, fig. 290). Utricle 1-seeded.

Achyránthes or **Iresine Verschaffèltii** is lately cult. for its red foliage, a poor substitute for Coleus, except in shade, where it has clear red stems, its ovate or roundish opposite leaves strongly veined or blotched with red, or wholly crimson.

Iresine celosioides, a wild tall weed, with opposite leaves, and panicles of small white-woolly flowers, is common S. W.

Acnida cannábina, in salt-marshes along the coast, is a tall annual, like an Amaranth, but diœcious, bracts inconspicuous, and the fleshy indehiscent fruit 3–5-angled and crested.

1. AMARÁNTUS, AMARANTH. (From Greek for *unfading.*) Coarse weeds of cult. and waste grounds, and one or two cultivated for ornament: fl. late summer. Bracts commonly awn-pointed. ①

§ 1. Red Amaranths, *the flower-clusters or the leaves tinged with red or purple.*

A. caudàtus, Princes' Feather. Cult. from India: tall, stout; leaves ovate, bright green; spikes red, naked, long and slender, in a drooping panicle, the terminal one forming a very long tail.

A. hypochondriacus. Cult. from Mexico, &c.: stout; leaves oblong, often reddish-tinged; flower-clusters deep crimson-purple, short and thick, the upper making an interrupted blunt spike.

A. paniculàtus. Coarse weed in gardens: the oblong-ovate or lance-oblong leaves often blotched or veined with purple; flowers in rather slender purplish-tinged spikes collected in an erect terminal panicle.

A. melanchólicus, Love-lies-Bleeding. Cult. from China or India: rather low; stems and stalks red; the ovate thin leaves dark purple or partly green; or, in var. tricolor, greenish with red or violet and yellow variously mixed; sepals and stamens only 3.

§ 2. Green Amaranths, or Pigweeds, *flowers and leaves green or greenish.*

A. retroflèxus, Common Pigweed: erect, roughish-pubescent or smoother; spikes crowded in a stiff panicle, the awn-pointed bracts rigid.

A. spinòsus, Thorny A. Waste ground, chiefly S.: dull green leaves with a pair of spines in their axils; flowers small, yellowish-green, in round axillary clusters and in a long terminal spike.

A. álbus. Roadsides and streets, spreading over the ground; with obovate and spatulate leaves, flowers all in small clusters in their axils and covered by rigid sharp-pointed bracts; sepals 3; stamens 2 or 3.

2. CELÒSIA, COCKSCOMB. (Name in Greek means *dried*, alluding to the scarious bracts.) Fl. summer. ①

C. cristàta, COMMON C. of the gardens, from India, in various usually monstrous forms, the showy flower-crests crimson-red, sometimes rose-colored, yellow, or white.

3. GOMPHRÈNA. (Ancient name of an Amaranth.) Fl. summer.

G. globòsa, GLOBE AMARANTH or BACHELOR'S-BUTTON. Cult. from India: low, branching, pubescent, with oblong nearly sessile leaves, and dense round heads crimson, rose-color, or white.

95. POLYGONACEÆ, BUCKWHEAT FAMILY.

Known by the alternate entire leaves having stipules in the form of scarious or membranous sheaths at the strongly marked usually tumid joints of the stem. Flowers mostly perfect, on jointed pedicels, with green or colored 4–6-parted usually persistent or withering calyx, 4–9 stamens on its base, 2 or 3 stigmas, 1-celled ovary with a single ovule rising from its base (Lessons, p. 110, fig. 342), forming an akene or nutlet. Embryo mostly on the outside of mealy albumen, the radicle pointing to the apex of the fruit.

ERIÓGONUM differs in having no obvious stipules, and the flowers from a cup-shaped involucre. There are a few species of the genus S. and S. W., and many near and beyond the Rocky Mountains.

§ 1. *Calyx of* 5, *rarely* 4, *more or less petal-like similar sepals, erect after flowering.*

1. POLYGONUM. Flowers in racemes, spikes, or else in the axils of the leaves. Akene either lenticular when there are 2 stigmas, or triangular when there are 3. Embryo curved round one side of the albumen: cotyledons narrow.
2. FAGOPYRUM. Differs from one section of Polygonum mainly in having an embryo in the centre of the albumen, which is divided into 2 parts by the very broad leaf-like cotyledons. The triangular akene longer than the calyx.

§ 2. *Calyx of* 6 *sepals often of two sorts: styles* 3.

3. RHEUM. Sepals all similar, petal-like, withering-persistent underneath the 3-winged fruit. Stigmas capitate or wedge-shaped. Stamens 9.
4. RUMEX. Sepals of 2 sorts; the 3 outer ones herbaceous and at length spreading; the alternate inner 3 larger, somewhat colored, enlarging after flowering, becoming veiny and dry, often bearing a grain-like tubercle on the back, and convergent over the 3-angled akene. Stigmas a hairy tuft. Stamens 6.

1. POLÝGONUM, KNOTWEED, JOINTWEED. (The name in Greek means *many-jointed.*) Chiefly weeds; some with rather showy flowers; the following are the commonest: fl. late summer and autumn.

§ 1. *Flowers along the stem, nearly sessile in the axils of the almost sessile linear or oblong leaves, small, greenish-white: sheaths scarious, usually cleft or torn and fringed.* ①

P. aviculàre, KNOT-GRASS, GOOSE-GRASS, or DOORWEED. Prostrate or spreading and variable low weed, with pale lanceolate or oblong leaves, commonly 5 stamens, and dull 3-sided akene enclosed in the calyx. Var. ERÉCTUM, has more upright stems, and larger oblong or oval leaves.

P. ramosíssimum. Chiefly W. in sandy soil: with nearly erect much-branched and rigid striate stems 2°–4° high; lanceolate or linear leaves tapering into a petiole, and a glossy akene; sepals 6 and stamens 6 or 3, or else sepals 5 with 4 or 5 stamens.

P. ténue. Rocky dry soil: slender, upright, with thread-like branches, along which the upper flowers form a loose leafy spike; leaves narrow linear, acute; akene shining.

§ 2. *Flowers collected in terminal spikes or spike-like racemes, rose-purple or flesh-color, or rarely white or greenish.*

* *Leaves small and thread-like or at length none: the sheaths truncate, naked, rigid: many-jointed raceme with a single flower under each bract.*

P. articulàtum. Sandy shores and barrens: a slender little plant, bushy-branching, 4′–12′ high; flowers rose-colored, nodding; stamens 8; akene triangular. ①

* * *Leaves ovate, short-petioled: sheaths cylindrical, fringed-hairy: greenish flowers* 1–3 *from each bract of the long and slender spikes, unequally* 4-*parted; the* 2 *styles reflexed on the lenticular akene and hooked at the tip.*

P. Virginiànum. Thickets: 2°–4° high, nearly smooth; leaves rough-ciliate, 3′–6′ long; flower somewhat curved; stamens 5. ♃

* * * *Leaves lanceolate, oblong, or ovate, chiefly petioled: sheaths cylindrical: flowers several from each bract of the spike,* 5-*parted.*

+– *Sheaths mostly with an abruptly spreading foliaceous border (which sometimes falls off): tall,* 3°–8° *high, with dense cylindrical nodding spikes of rose-colored flowers, and flat akenes.*

P. orientàle, Princes' Feather. Gardens and cultivated grounds, from India: with large ovate pointed leaves, and 7 stamens.

P. Càreyi. Swamps from Pennsylvania N. & E.: with lanceolate leaves, glandular bristly peduncles, and 5 stamens.

+– +– *Sheaths truncate, without a border.*

–+ *Herbage and flowers not acrid nor punctate with pellucid glands or dots.*

= *In moist soil: leaves lanceolate: plants nearly smooth.* ①

P. incarnàtum. Tall, 3°–6° high; leaves tapering from near the base to a narrow point (4′–12′ long); sheaths smooth and naked; peduncles rough with scattered sessile glands; spikes linear, nodding; flowers flesh-color or pale rose; the 6 stamens and 2 styles included; akene flat with concave sides.

P. Pennsylvánicum. Stems 1°–3° high, the branches above and peduncles bristly with stalked glands; sheaths naked; spikes oblong, thick and blunt, erect; flowers rose-purple; stamens 8, a little protruding; style 2-cleft; akene with flat sides.

P. Persicària, Lady's Thumb. Nat. from Eu. near dwellings, about 1° high: upper face of leaves with a dark blotch near the middle; sheaths somewhat bristly-ciliate; spikes oblong, dense, erect, on naked peduncles; flowers greenish-purple; stamens mostly 6; style 2–3-cleft; akene either flattish or triangular.

= = *In water: stems rooting below.* ♃

P. amphíbium. Water P. Chiefly N.: stems often simple bearing a single ovate or oblong dense spike or head of pretty large and showy rose-red flowers; leaves oblong, heart-oblong, lance-ovate or lanceolate, mostly long-petioled, often floating; sheaths not fringed; stamens 5; style 2-cleft.

P. hydropiperoides. Commonest S.: stems slender, rising out of shallow water 1°–3° high; leaves narrowly lanceolate or lance-oblong; sheaths hairy and fringed with long bristles; spikes erect, slender; flowers small, pale or white; stamens 8; style 3-cleft; akene sharply triangular.

–+ –+ *Herbage (smooth) pungently acrid: leaves and pale sepals marked with pellucid dots or glands, in which the acrid quality resides: sheaths fringed with bristles.*

P. àcre, Water Smartweed. Shallow water or wet soil: stems rooting at the decumbent base, rising 2°–4° high; leaves lanceolate or linear, taper-pointed; spikes slender, erect; flowers whitish or pale flesh-color; stamens 8; akene sharply triangular, shining. ♃

P. Hydrópiper, COMMON S. or WATER PEPPER. Low or wet grounds N.: 1°–2° high; leaves oblong-lanceolate; spikes nodding, mostly short; flowers greenish-white; stamens 6; akene either flat or obtusely triangular. ①

* * * * *Leaves heart-shaped or arrow-shaped, petioled: sheaths half-cylindrical.*

+– TEAR-THUMB. *Stems with spreading branches, the angles and petioles armed with sharp reflexed prickles, by which the plant is enabled almost to climb: flowers in peduncled heads or short racemes, white or flesh-color.* ①

P. arifòlium. Low grounds: leaves halberd-shaped, long-petioled; the peduncles glandular-bristly; stamens 6; styles 2; akene lenticular.

P. sagittàtum. Low grounds: leaves arrow-shaped, short-petioled; the peduncles naked; stamens mostly 8; styles 3; akene sharply 5-angled.

+– +– BLACK BINDWEED. *Stems twining, not prickly: flowers whitish, in loose panicled racemes: three outermost of the 5 divisions of the calyx keeled or crested, at least in fruit: stamens* 8: *styles* 3: *akenes triangular.*

P. Convólvulus. Low twining or spreading weed from Eu., in cultivated fields, &c.: smoothish, with heart-shaped and almost halberd-shaped leaves, and very small flowers. ①

P. cilinòde. Rocky shady places: tall-twining, rather downy, a ring of reflexed bristles at the joints; leaves angled-heart-shaped; outer sepals hardly keeled. ♃

P. dumetòrum, CLIMBING FALSE BUCKWHEAT. Moist thickets: tall-twining, smooth; joints naked; leaves heart-shaped or approaching halberd-shaped; panicles leafy; outer sepals strongly keeled and in fruit irregularly winged. ♃

2. FAGOPŸRUM, BUCKWHEAT. (The botanical name, from the Greek, and the popular name, from the German, both denote *Beech-wheat*, the grain resembling a diminutive beech-nut.) Cult. from N. Asia, for the flour of its grain: fl. summer. ①

F. esculéntum, COMMON B. Nearly smooth; leaves triangular-heart-shaped inclining to halberd-shaped or arrow-shaped, on long-petioles; sheaths half-cylindrical; flowers white or nearly so in corymbose panicles; stamens 8, with as many honey-bearing glands interposed; styles 3; acutely triangular akene large.

F. tartáricum, TARTARY or INDIAN WHEAT. Cult. for flour on our N. E. frontiers and N.: like the other, but flowers smaller and tinged with yellowish; grain half the size, with its less acute angles wavy.

3. RHÈUM, RHUBARB. (Name said to come from the Greek, and to refer to the purgative properties of the root; that of several species, of N. Asia, yield officinal *rhubarb*.) ♃

R. Rhapónticum, GARDEN R. or PIE-PLANT; the large fleshy stalks of the ample rounded leaves, filled with pleasantly acid juice, cooked in spring as a substitute for fruit; flowers white, in late spring.

4. RÙMEX, DOCK, SORREL. (Old Latin name.) The three enlarged sepals which cover the fruit are called *valves*. Flowers greenish, in whorls on the branches, forming panicled racemes or interrupted spikes.

§ 1. DOCK. *Herbage bitter: flowers perfect or partly monœcious, in summer.*

* *In marshes: stem erect, stout: leaves lanceolate or lance-oblong, flat, not wavy: valves entire or obscurely wavy-toothed in the first species.* ♃

R. orbiculàtus, GREAT WATER DOCK. Common N.: 5°–6° high; leaves often 1°–2° long; flowers nodding on slender pedicels; the valves round-ovate or almost orbicular, thin, finely reticulated, nearly ¼′ wide, each bearing a grain.

R. Británnica, PALE D. Commoner S.: 2°–6° high; pedicels nodding, shorter than the fruiting calyx, which has broadly ovate loosely reticulated valves, one with a large grain, the others commonly naked; root yellow.

R. salicifòlius, WHITE D. Salt marshes: 1°–3° high; pedicels much shorter than the fruiting calyx and in much-crowded whorls, forming a spike; valves more triangular than in the foregoing and smaller, their grain very large; root white.

R. verticillàtus, SWAMP D. Common N.: 3°–5° high; whorls loose; fruit-bearing pedicels slender and club-shaped, abruptly reflexed; valves somewhat rhombic and with narrow blunt apex, each bearing a very large grain; leaves thickish, the lowest often heart-shaped at base.

* * *Weeds nat. from Europe in cult. or waste ground: stem erect, 2°–4° high: lower leaves or some of them heart-shaped at base, all more or less wavy: root commonly yellow and spindle-shaped.* ♃

R. crìspus, CURLED D. Leaves green, lanceolate, very wavy-curled, the lower rather truncate than heart-shaped at base; whorls crowded in long racemes; valves rounded, heart-shaped, nearly entire; mostly grain-bearing.

R. sanguíneus, BLOODY-VEINED or RED D. Leaves less curled and red-veined, lanceolate or oblong; whorls distant; pedicels very short; valves narrowly oblong, one or more grain-bearing.

R. obtusifòlius, BITTER D. Leaves little wavy, the upper lance-oblong and acute, lower oblong-heart-shaped and obtuse; whorls loose and distant; valves ovate, partly halberd-shaped, beset with some long sharp teeth near the base, usually only one grain-bearing.

* * * *Sandy sea-shore and river-banks N.: 5′–12′ high, spreading.* ①

R. marítimus. Minutely pubescent; leaves lance-linear, wavy-margined, the lower auricled or heart-shaped at base; whorls much crowded into leafy spikes; valves rhombic-oblong with a tapering point, turning orange-colored, a large grain on the back and 2 or 3 long stout bristles on each margin.

§ 2. SORRELS. *Herbage acid: some leaves halberd-shaped, others with entire narrowed base: flowers diœcious, small, in a terminal naked panicle: valves naked: fl. spring and summer.* ♃

R. Acetosélla, COMMON or SHEEP SORREL. Low weed in all sterile fields; leaves lance-oblong or halberd-shaped, the lobes or auricles narrow; pedicels jointed with the flower; ovate valves hardly enlarging in fruit.

R. Engelmánni, only S. & W., differs in pedicels jointed near the middle, and thin rounded heart-shaped valves becoming many times larger than the akene.

96. LAURACEÆ, LAUREL FAMILY.

Spicy-aromatic trees or shrubs, the alternate simple leaves (with entire margins but sometimes lobed) more or less marked with minute pellucid dots; the regular flowers with a calyx of 4 or 6 sepals imbricated in two ranks in the bud, and free from the ovary; the latter is terminated by a simple style and stigma, is 1-celled with a hanging ovule, and in fruit becomes a berry or drupe. The stamens (in ours 9) furnish a special character, their anthers opening by uplifted valves! To this family belong the classical Laurel or Bay, the Cinnamon, the Camphor-tree, &c.

* *Flowers perfect, in axillary panicles.*

1. PERSEA. Calyx 6-parted, persistent at the base of the berry. Stamens 9 with anthers, the 3 outer of which are turned outwards, the 6 others inward; also 3 glands or sterile filaments forming an innermost row. The two proper cells of the anther with a lower and an upper chamber, making 4 compartments, each opening by a valve in the manner of a trap-door.

* * *Flowers wholly or nearly diœcious, greenish-yellow, leaves deciduous.*

2. SASSAFRAS. Flowers in an open corymbed and peduncled cluster, with spreading 6-parted calyx: sterile ones with 9 stamens in 3 rows, the filaments of the three inner with a pair of yellow stalked glands on their base. Anthers with 4 chambers as in the preceding. Fertile flowers with 6 rudiments of stamens and an ovoid ovary, becoming a drupe.

3. LINDERA. Flowers in sessile lateral clusters, with a 6-parted honey-yellow calyx: sterile ones with 9 stamens having simply 2-celled and 2-valved anthers; the inner 3 filaments lobed and glandular at base. Fertile flowers with a globular ovary, surrounded by numerous rudiments of stamens. Berry red, oval; the stalk not thickened.
4. TETRANTHERA. Flowers in small lateral clustered umbels, with 6-parted deciduous calyx: sterile ones with 9 similar stamens; anthers turned inwards, the 2 cells with 2 chambers, each opening by a valve, as in Sassafras. Fertile flowers with a globular ovary, surrounded by numerous rudiments of stamens, and becoming a globular drupe or berry.

1. PÉRSEA, RED BAY. (Ancient of some Oriental tree.) Leaves evergreen: flowers greenish-white, in summer.

P. Carolinénsis, CAROLINA RED BAY. Tree or large shrub, in low grounds, from Delaware S.: hoary when young, the oblong leaves soon smooth above; berries blue on a red stalk.

2. SÁSSAFRAS. (The popular name of this very well-known tree.)

S. officinàle, SASSAFRAS. In rich woods: a fine tree with mucilaginous yellowish twigs and foliage, spicy bark, flowers appearing in spring with the leaves; these ovate and obovate, and some of them 3-cleft, smooth when old; fruit blue on a club-shaped rather fleshy stalk.

3. LÍNDERA, SPICEBUSH, WILD ALLSPICE, FEVERBUSH. (Named for *J. Linder*, a Swedish botanist.) Genus also named BENZOIN. Shrubs: fl. in spring, preceding the leaves.

L. Benzòin, COMMON S or BENJAMIN-BUSH. Damp woods: 6° – 15° high, almost smooth; leaves thin, obovate-oblong, acute at base, 3′ – 5′ long.

L. melissæfòlia. Wet grounds S.: 2° – 3° high, silky-pubescent; leaves oblong, obtuse or slightly heart-shaped at base, 1′ – 2′ long, when old smooth above.

4. TETRANTHÈRA. (Name in Greek means *four anthers*, alluding to the 4 chambers to each anther.)

T. geniculàta, POND SPICE. Along ponds in pine-barrens from Virginia S.: large shrub, soon smooth, with forking and divergent or zigzag branches, rather coriaceous oval or oblong leaves (½′ – 1′ long), appearing later than the flowers in spring; these in little crowded clusters of 2 – 4 from 2 – 4-leaved involucres; fruit red, globular.

97. THYMELEACEÆ, MEZEREUM FAMILY.

Shrubs with acrid and very tough fibrous bark, entire leaves, and perfect flowers, having a simple corolla-like calyx, bearing twice as many stamens as its lobes (usually 8), the anthers of the ordinary sort; the free ovary one-celled, with a single hanging ovule, becoming a berry-like fruit. Flowers commonly in umbel-like clusters.

1. DAPHNE. Calyx salver-shaped or somewhat funnel-shaped; the 4 lobes spreading, the 8 anthers nearly sessile on its tube, included. Style very short or none: stigma capitate.
2. DIRCA. Calyx tubular, without any spreading lobes, the wavy-truncate border sometimes obscurely indicating 4 teeth. The 8 stamens and the style long and slender, protruding.

1. DÁPHNE. (Mythological name, the nymph transformed by Apollo into a Laurel.) The following cult. for ornament from the Old World.

D. Mezèreum, MEZEREUM. Hardy low shrub from Europe, 1° – 3° high, with purple-rose-colored (rarely white) flowers, in lateral clusters on shoots of the preceding year, in early spring, before the lanceolate very smooth green leaves; berries red.

D. Cneòrum. Hardy under-shrub from Eu., spreading and branching, with crowded lance-oblong or oblanceolate evergreen leaves (less than 1′ long), and a terminal cluster of handsome rose-pink flowers in spring.

D. odòra, SWEET DAPHNE. Greenhouse shrub from China, with bright green lance-oblong evergreen leaves, and terminal clusters of white or pale pink sweet-scented flowers, in winter.

2. DÍRCA, LEATHERWOOD, MOOSE-WOOD. (Classical Greek name of a celebrated fountain.)

D. palústris, the only species, in damp woods chiefly N.: shrub 2°–6° high, with tender white wood, but very tough bark, used by the Indians for thongs (whence the popular names), the numerous branches as if jointed; leaves obovate or oval, alternate, nearly smooth, deciduous; flowers before the leaves in earliest spring, honey-yellow, few in a cluster from a bud of 3 or 4 dark-hairy scales forming an involucre; berry reddish.

98. ELÆAGNACEÆ, OLEASTER FAMILY.

Silvery-scurfy shrubs or small trees, having often diœcious inconspicuous flowers, the calyx-tube of the fertile ones itself enclosing the ovary, becoming fleshy and ripening into a sort of berry, around the akene-like true fruit, the seed of which is erect. Otherwise much like the preceding family.

Shephérdia Canadénsis, a low shrub along our northern borders, with opposite oval leaves, soon green above, but silvery and with some rusty scurf beneath, diœcious 4-parted flowers, and yellow berries.

S. argéntea, BUFFALO-BERRY, shrub through the plains and mountains far W. and N. W., and planted for ornament, has alternate oblong leaves with narrowed base, silvery both sides, and edible acid red berries.

Elæágnus argéntea, SILVER-BERRY of the far West, also cult., with oval silvery leaves and mealy edible berries; the genus known by the mostly perfect flowers with salver-shaped calyx, the stamens only as many as the lobes, usually 4. — One or two Old World species are occasionally planted.

99. SANTALACEÆ, SANDALWOOD FAMILY.

Represented by one or two shrubs along the Alleghanies S., one of them the PYRULÀRIA OLEÍFERA, the OIL-NUT or BUFFALO-NUT, — and widely by a low herb, viz.

1. Comándra umbellàta. Dry ground, common N.: probably parasitic on the roots of shrubs. Known by the 5 stamens with their anthers connected with the face of the white calyx-lobes behind them by a tuft of thread-like hairs (to which the name, from the Greek, alludes); tube of the calyx coherent below with the ovary, becoming a hard or nut-like fruit, filled by a globular seed. Stems 6′–10′ high, with many small oblong pale leaves.

100. LORANTHACEÆ, MISTLETOE FAMILY.

Parasitic on the branches of trees, represented only, through the Middle and Southern States, by

Phoradéndron flavéscens, AMERICAN MISTLETOE; with obovate or oval, yellowish-green, thick, slightly petioled leaves, and short yellowish jointed spikes in their axils, of diœcious greenish flowers, the fertile ones ripening white berries.

101. SAURURACEÆ, LIZARD'S-TAIL FAMILY.

A very small family, having a single Eastern North American representative in

Saurùrus cérnuus, LIZARD'S-TAIL. Wet swamps: fl. summer; stem jointed, 2° high, branching; leaves heart-shaped, with converging ribs, petioled; flowers white, crowded in a dense but slender tail-like spike, with the end nodding, perfect, but with neither calyx nor corolla; stamens 6 or 7, with long slender white filaments; pistils 3 or 4, slightly united at base. (Lessons, p. 86, fig. 234.)

102. EUPHORBIACEÆ, SPURGE FAMILY.

Plants with mostly milky acrid juice and monœcious or diœcious flowers, of very various structure; the ovary and fruit commonly 3-celled and with single or at most a pair of hanging ovules and seeds in each cell.

§ 1. *Ovules and seeds only one in each cell.*

* *Flowers both staminate and pistillate really destitute both of calyx and corolla: a pistillate and numerous staminate surrounded by a cup-like involucre which imitates a calyx, so that the whole would be taken for one perfect flower.*

1. EUPHORBIA. For the structure of the genus, which is recondite, see Manual, and Structural Botany, fig. 1143. These plants may be known, mostly, by having the 3-lobed ovary raised out of the cup, on a curved stalk, its 3 short styles each 2-cleft, making 6 stigmas. Fruit when ripe bursting into the 3 carpels, and each splitting into 2 valves, discharging the seed. What seems to be a stamen with a jointed filament is really a staminate flower, in the axil of a slender bract, consisting of a single stamen on a pedicel, the joint being the junction.

* * *Flowers of both kinds provided with a distinct calyx.*

2. STILLINGIA. Flowers in a terminal spike, naked and staminate above, a few fertile flowers at base. Calyx 2–3-cleft. Stamens 2, rarely 3. Pod 3-lobed. Stigmas 3, simple. Bracts with a fleshy gland on each side. Leaves alternate, stipulate.
3. ACALYPHA. Flowers in small clusters disposed in spikes, staminate above, fertile at base; or sometimes the two sorts in separate spikes. Calyx of sterile flowers 4-parted, of fertile 3–5-parted. Stamens 8–16, short, monadelphous at base; the 2 cells of the anther long and hanging. Styles 3, cut-fringed on the upper face, red. Pod of 3 (rarely 2 or 1) lobes or cells. Fertile flower-clusters embraced by a leaf-like cut-lobed bract. Leaves alternate, petioled, with stipules, serrate.
4. RICINUS. Flowers in large panicled clusters, the fertile above, the staminate below. Calyx 5-parted. Stamens very many, in several bundles. Styles 3, united at base, each 2-parted, red. Pod large, 3-lobed, with 3 large seeds. Leaves alternate, with stipules.
5. JATROPHA. Flowers in cymes or panicles; the fertile in the main forks. Calyx colored like a corolla, in the sterile flowers mostly salver-shaped and 5-lobed, enclosing 10–30 stamens, somewhat monadelphous in two or more ranks; in the fertile 5-parted. Styles 3, united below, once or twice forked at the apex. Pod 3-celled, 3-seeded. Leaves alternate, long-petioled, with stipules.

§ 2. *Ovules and mostly seeds 2 in each cell of the ovary and 3-horned pod. Juice not milky in the following: which have monœcious flowers, 4 sepals, 4 exserted stamens in the sterile, and 3 awl-shaped spreading or recurved styles or stigmas in the fertile flowers.*

6. BUXUS. Flowers in small sessile bracted clusters in the axils of the thick and evergreen entire opposite leaves. Shrubs or trees.
7. PACHYSANDRA. Flowers in naked lateral spikes, staminate above, a few fertile flowers at base. Filaments long, thickish and flat, white. Nearly herbaceous, low, tufted: leaves barely evergreen, alternate, coarsely few-toothed.

1. EUPHÓRBIA, SPURGE. (Said to be named for *Euphorbus,* physician to King Juba.) Flowers commonly in late summer.

§ 1. *Shrubby species of the conservatory, winter-flowering, with red bracts or leaves.*

E. pulchérrima, or POINSETTIA, of Mexico : unarmed stout shrub, with ovate or oblong and angled or sinuately few-lobed leaves, rather downy beneath, those next the flowers mostly entire (4′ – 5′ long) and of the brightest vermilion-red ; flowers in globular greenish involucres bearing a great yellow gland at the top on one side.

E. spléndens, of the Mauritius : smooth with thick and horridly prickly stems, oblong-spatulate mucronate leaves, and slender clammy peduncles bearing a cyme of several deep-red apparently 2-petalous flowers ; but the seeming petals are bracts around the cup-like involucre of the real flowers.

E. fúlgens, or JACQUINIÆFLÒRA, of Mexico : unarmed, smooth, with slender recurved branches and broadly lanceolate leaves, few-flowered ; peduncles shorter than the petioles, what appears like a 5-cleft corolla are the bright red lobes of the involucre.

§ 2. *Herbs natives of or naturalized in the country, the first and last and sometimes a few of the others cult. in gardens : fl. late summer.*

* *The leaves which are crowded next the flower-cups or involucres have their margins or a part of the base colored (white or red) : stem erect,* 1° – 3° *high.* ①

E. marginàta. Wild on the plains W. of the Mississippi, and cult. for ornament : leaves pale, ovate or oval, sessile, the lower alternate, uppermost in threes or pairs and broadly white-margined ; flower-cup with 5 white petal-like appendages behind as many saucer-shaped glands.

E. heterophýlla. Rocky banks S. W. : smooth ; leaves alternate, ovate and sinuate-toothed, or fiddle-shaped, or some of them lanceolate or linear and entire ; the upper with red base ; no petal-like appendages to the flower-cup and only 1 or 2 sessile glands.

E. dentàta. Rich soil from Penn. S. W. : hairy, only the lower leaves alternate, the upper opposite, varying from ovate to linear, uppermost paler or whitish at base, and the few glands of the flower-cup short-stalked.

* * *The leaves none of them colored : but the flower-cup with 5 bright-white conspicuous appendages, imitating a 5-cleft corolla.* ♃

E. corollàta. Gravelly or sandy soil, from New York S. & W. : 2° – 3° high ; leaves varying from ovate to linear, entire, the lower alternate, upper whorled and opposite ; flower-cups umbelled, long-stalked.

* * * *Leaves all alike and opposite, green, or with a brown-red spot, short-petioled, with scaly or fringed-cut stipules : stems low-spreading or prostrate, repeatedly forked : a small flower-cup in each fork, bearing 4 glands, each bordered with a more or less petal-like white or reddish margin or appendage. Of these there are several species, insignificant weeds ; these two are the commonest everywhere in sandy or gravelly open places.*

E. maculàta. Prostrate ; leaves oblong-linear, very oblique at base, serrulate above, blotched in the centre ; pods sharp-angled, very small.

E. hypericifòlia. Ascending 10′ – 20′ high ; leaves ovate-oblong or linear-oblong, serrate, often with red spot or margins ; pod blunt-angled ; seeds wrinkled.

* * * * *Leaves without stipules, none with colored margins or spots : the flower-cups also green or greenish, umbelled, their glands wholly destitute of any petal-like appendage.*

– *Leaves of the commonly erect stem alternate or scattered : those of the umbel-like inflorescence whorled or opposite and of different shape, usually roundish : glands of the flower-cup mostly* 4. *Weeds or weed-like.*

– – *Glands of the flower-cup transversely oval and obtuse.* ①

E. platyphýlla. Nat. from Europe N. : upper stem-leaves lance-oblong, acute, minutely serrulate ; uppermost heart-shaped ; floral ones triangular-ovate and heart-shaped ; umbel 5-rayed ; glands large and sessile ; pod beset with depressed warts ; seed smooth.

E. obtusàta. Native W. & S.: like preceding, but taller, 1° – 2° high; stem-leaves oblong-spatulate and obtuse, the upper heart-shaped; floral ones dilated-ovate; umbel once or twice 3-rayed, then 2-rayed; glands of flower-cup short-stalked; pods long-warty.

E. dictyospérma. Open ground S. W. Resembles the preceding, but slender; leaves obtusely serrate; glands small, almost sessile; seeds delicately reticulated.

E. Helioscòpia. Weed from Europe in waste places N.: with stouter ascending stems 6′ – 12′ high; leaves all obovate and rounded or notched at the end, the lower wedge-shaped, finely serrate; umbel first with 5, then 3, and at length with 2 rays; glands orbicular and stalked; pods smooth and even; seeds with honeycomb-like surface.

++ ++ *Glands of the flower-cup with 2 long horns: pod smooth: seeds sculptured or pitted and pale.* ① ②

E. Péplus. Waste places, from Eu.: stem erect; leaves petioled, entire, round-obovate, the upper floral ones ovate; umbel first 3-rayed, afterwards 2-forked; pod 2-crested on each lobe.

E. commutàta. Wild from Wisconsin and Virginia S. W., on shady slopes: stems with decumbent base; leaves obovate, the upper sessile, the rounded floral ones broader than long; umbel 3-forked; pod crestless: fl. early summer.

++ ++ ++ *Glands crescent-shaped: pod granular: seeds smooth, dark-colored.* ♃

E. Cyparíssias, Cypress Spurge. Gardens from Eu. and running wild E.: in dense clusters 6′ – 10′ high, smooth; stem and branches crowded with small linear entire leaves, the floral ones small and rounded heart-shaped; umbel many-rayed.

+ + *Leaves all or chiefly opposite, entire, smooth, almost sessile: pod smooth.*

E. Ipecacuánhæ, Ipecac Spurge. Sandy soil from New York S.: branching repeatedly from the long perpendicular root, widely spreading; leaves barely 1′ long, varying from obovate to linear; peduncles solitary in the forks, slender; flower-cup dull purple, with 5 glands. ♃

E. Láthyris, Caper Spurge. Cult. from Eu. in country gardens: glaucous; stem erect, stout, 2° – 3° high; leaves thick; those of the stem lance-linear, floral ones oblong-ovate and heart-shaped; umbel 4-rayed, then forking; glands short-horned. ②

2. STILLÍNGIA. (Named for *Dr. B. Stillingfleet.*) Very smooth plants, only S.: flowering all summer.

S. sylvática, Queen's Delight. Dry soil from Virginia S.: herb 1° – 3° high, clustered from a woody root; leaves crowded, almost sessile, varying from obovate to lance-linear, serrulate; stamens 2.

S. ligustrìna. River-swamps from N. Carolina S.: shrub 6° – 12° high; leaves lance-obovate or oblong, entire; spikes short; stamens mostly 3.

S. sebífera, Tallow-tree of China, planted South Carolina & S.: tree 20° – 40° high; leaves rhombic-ovate, entire, long-petioled; stamens 2; seeds white, yielding a useful vegetable tallow or wax.

3. ACALÝPHA. (Ancient Greek name of *Nettle.*) Flowering through late summer and autumn.

A. Virgínica. A most common, coarse, low weed in fields, &c: smoothish or hairy, turning purplish, with leaves varying from ovate to linear, fertile flowers in short clusters; pod and seed smoothish. ①

A. Caroliniàna. Cult. ground, chiefly S.: has thin heart-shaped closely serrate leaves, mostly a long terminal fertile spike, pods beset with soft prickles, and seeds rough-wrinkled. ①

4. RÍCINUS, PALMA-CHRISTI, CASTOR-OIL PLANT. (Latin name of a bug, which the seed resembles.)

R. commùnis, the only species, but of many varieties, native probably of Africa: a sort of tree, but cult. in temperate climates as a stately annual, for its

seeds, from which *castor-oil* is expressed, and in ornamental grounds for its magnificent foliage; the peltate and palmately 7–11-cleft leaves 1°–2° broad, or even more: fl. late summer.

5. JÁTROPHA. (Derivation of name obscure.) Chiefly tropical plants; one is a weedy plant wild S., viz.

J. ùrens, var. **stimulòsa** (or J. STIMULÒSA), TREAD-SOFTLY or SPURGE-NETTLE, names referring to its stinging bristly hairs, which are like those of Nettles: dry sandy soil, branching, 6′–12′ high; leaves rounded heart-shaped, 3–5-lobed or variously cleft or parted; flowers slender, white; stamens 10, their filaments almost separate. ♃

6. BÚXUS, BOX. (Ancient Latin, from the Greek name of the Box-tree.)

B. sempérvirens, TREE BOX, and its more common var. NÀNA, the DWARF BOX, with much smaller leaves, from the Mediterranean, are planted North chiefly for borders, especially the Dwarf Box.

7. PACHYSÁNDRA. (The name in Greek means *thick stamens.*) ♃

P. procúmbens. Rocky woods, W. slope of the Alleghanies, and in some gardens; developing its copious spikes from the base of the short procumbent densely tufted stems, in early spring.

103. URTICACEÆ, NETTLE FAMILY.

This family, taken in the largest sense, includes very various apetalous plants, with monœcious or dicœcious flowers (except in the Elm Family), having a distinct calyx free from the 1-seeded fruit. Inner bark generally tough. Leaves with stipules, which are sometimes early deciduous. There are four suborders.

I. ELM FAMILY. Trees, the juice not milky. Leaves alternate, 2-ranked, simple: stipules small and falling early. Flowers monœciously polygamous, many of them perfect, with the filaments not inflexed in the bud, and 2 diverging styles or long stigmas. Ovary 1–2-celled, with 1 or 2 hanging ovules, in fruit always 1-celled and 1-seeded.

* *Fruit dry, winged or nut-like. Anthers turned outwards.*

1. ULMUS. Calyx bell-shaped, 4–9-cleft. Stamens 4–9: filaments long and slender. Ovary mostly 2-celled, becoming a 1-celled thin samara or key-fruit winged all round (Lessons, p. 122, fig. 390). Flowers in clusters in axils of last year's leaves, in early spring, before the leaves of the season, purplish or yellowish-green. Leaves straight-veined, serrate.
2. PLANERA. Like Elm, but flowers more polygamous, appearing with the leaves in small axillary clusters; the lobes of the calyx and stamens only 4 or 5; the 1-celled 1-ovuled ovary forming a wingless nut-like fruit.

* * *Fruit a berry-like globular small drupe. Anthers turned inward.*

3. CELTIS. Calyx 5–6-parted, persistent. Stamens 5 or 6. Stigmas very long, tapering. Ovary and drupe 1-celled, 1-seeded. Flowers greenish, in the axils of the leaves; the lower ones mostly staminate and clustered, the upper fertile and mostly solitary on a slender peduncle.

II. FIG FAMILY. Trees with milky or colored acrid or poisonous juice. Leaves alternate. Flowers strictly monœcious or dicœcious. Styles or stigmas commonly 2.

§ 1. *Flowers of both kinds mixed, lining the inside of a closed fleshy receptacle, or hollow flower-stalk, which ripens into what seems to be a sort of berry.*

4. FICUS. Receptacle in which the flowers are concealed borne in the axil of the leaves. Akene seed-like. Stipules large, successively enveloping the young leaves in the bud, falling off as the leaves expand

§ 2. *Flowers of the two kinds mostly separate; the fertile crowded in catkin-like spikes or heads, which become fleshy in fruit: filaments inflexed in the bud, spreading elastically when the calyx expands.*

5. MORUS. Flowers usually monœcious, both sorts in catkin-like spikes. Calyx 4-parted. Stamens 4. Fertile spike altogether becoming an oval or oblong multiple pulpy fruit imitating a blackberry, but the pulp consists of the calyx, bracts, &c. of the flowers, each enclosing a small akene.
6. BROUSSONETIA. Flowers dicœcious; the sterile in cylindrical catkins, and like those of Mulberry; the fertile in globular heads, mixed with little bristly scales, their calyx urn-shaped and 3–4-toothed, out of which the ripened ovary protrudes and forms a club-shaped rather fleshy fruit. Style single.
7. MACLURA. Flowers dicœcious; the sterile in racemes, and nearly like those of Mulberry; the fertile densely crowded in a large spherical head, its calyx of 4 unequal sepals, in fruit enclosing the small akene: the whole head ripening into a fleshy yellow mass, resembling an orange with a roughish surface.

III. NETTLE FAMILY PROPER. Herbs, as to our wild species, with bland watery juice and tough fibrous bark: many are armed with stinging hairs. Flowers monœcious or dicœcious, greenish. Filaments transversely wrinkled and inflexed in the bud, straightening elastically when the calyx opens. Fruit an akene: style or stigma one and simple. — All ours worthy of notice belong to the three following genera.

8. URTICA. Flowers in racemed, spiked, or head-like clusters; the calyx in both sorts of 4 separate sepals. Stamens 4. Stigma a sessile globular tuft. Akene flat, ovate, straight and erect, enclosed between the larger pair of sepals. Herbage beset with stinging hairs: leaves opposite.
9. LAPORTEA. Flowers in loose open cymes, the upper chiefly fertile, and lower sterile; the latter with 5 sepals and stamens; the former of 4 very unequal sepals, the two outer or one of them minute. Stigma slender awl-shaped, hairy down one side, persistent on the ovate flat very oblique and nearly naked akene, which is soon reflexed on its wing-margined pedicel. Herbage beset with stings: leaves large, alternate.
10. BŒHMERIA. Flowers either dicœcious or intermixed, clustered in spikes; the sterile as in Urtica; the fertile with a tubular or urn-shaped calyx barely toothed at the apex, enclosing the ovary and closely investing the oblong flat akene. No stings.

IV. HEMP FAMILY. Rough herbs, with watery juice and tough fibrous bark. Leaves mostly opposite and palmately lobed or compound. Flowers dicœcious, greenish; the sterile in axillary loose compound racemes or panicles, the fertile in close clusters or catkins: calyx of the former with 5 sepals, of the latter one scale-like sepal embracing the ovary and akene. Stigmas or hairy styles two, long.

11. CANNABIS. Erect herb. Stamens 5, drooping. Fertile flowers in irregular spiked clusters. Leaves of 5–7 lanceolate irregularly toothed leaflets.
12. HUMULUS. Tall-twining. Stamens erect. Fertile flowers in solitary short catkins or spikes, 2 flowers under each of the broad thin bracts which make the scales of the strobile or hop-fruit.

1. ÚLMUS, ELM. (The classical Latin name.) Fine trees in deep, mostly moist or alluvial soil. Fl. early spring; fruit in early summer.

§ 1. *Leaves rough and harsh on the upper, soft and usually downy on the lower surface: seed in the middle of the orbicular or round-oval fruit, far away from the shallow notch: flower-clusters globular: pedicels very short.*

U. fúlva, SLIPPERY ELM. Common, rather small tree through the country, with tough reddish wood, well-known very mucilaginous inner bark, and

rusty-downy buds; leaves 4′–8′ long, doubly serrate, very rough above; these and the flowers sweet-scented in drying; calyx-lobes and stamens 7–9; fruit much less than 1′ long, the seed-bearing centre pubescent.

U. montàna, WYCH or SCOTCH ELM. Planted from Eu.: leaves smaller and less rough; buds not downy; calyx-lobes and stamens about 5; fruits 1′ long, smooth.

§ 2. *Leaves smooth above, smaller: notch at the summit of the fruit reaching nearly to the seed-bearing cell: fruit only about ½′ long.*

* *European species occasionally planted: flowers in close clusters: pedicels very short or hardly any: stamens 4 or 5: fruit smooth, round-obovate.*

U. campéstris (or GLÀBRA), ENGLISH ELM. Large tree with rather short horizontal or ascending branches; leaves 2′–4′ long, mostly or soon smooth.

U. suberòsa, EUROPEAN CORK-ELM. Probably a mere variety of the preceding, with thick plates of cork on the branches.

* * *Wild species, with the flowers soon hanging on slender stalks, which are jointed above the middle: fruit ovate or oval, with 2 sharp teeth at apex, the margin downy-ciliate at least when young.*

U. Americàna, AMERICAN or WHITE ELM. Well known large tree, with long ascending branches gradually spreading, drooping slender branchlets, which are smooth as well as the buds, not corky; the abruptly pointed leaves 2′–4′ long; flowers in close clusters, with usually 7–9 calyx-lobes and stamens; fruit smooth except the margins, its incurved points closing the notch.

U. racemòsa, CORKY WHITE ELM. Resembles the foregoing, but with downy-ciliate bud-scales; branches becoming corky, young branchlets somewhat pubescent, leaves with straighter veins, and flowers racemed.

U. alàta, WHAHOO or WINGED ELM. Virginia to Ill. and S.: small tree, with bud-scales and branchlets nearly smooth, winged plates of cork on the branches, and small thickish leaves (1′–2′ long) almost sessile.

2. PLÁNERA, PLANER-TREE. (Named for *I. J. Planer*, a German Botanist.) Flowers greenish, appearing with the leaves in early spring.

P. aquática, AMERICAN P. River swamps, from Kentucky S.: small tree, leaves ovate-oblong, smooth; fruit stalked in the calyx, beset with irregular warts or crests.

3. CÉLTIS, HACKBERRY or NETTLE-TREE. (Ancient Greek name for the *Lotus-berry*, produced by the European species.) Fl. spring: fruit ripe in autumn, eatable.

C. occidentàlis, AMERICAN H. Small or middle-sized tree, of rich low grounds; with reticulated ovate and taper-pointed serrate or entire leaves, oblique or partly heart-shaped at base, sweet thin-fleshed fruit as large as a pea. Var. PÙMILA, a straggling bush, chiefly S., only 4°–10° high.

4. FÌCUS, FIG. (The Latin, altered from the Greek name of the Fig.)

F. Cárica, COMMON FIG. Cult. from the Levant, as a house-plant N.: leaves broad, 3–5-lobed, roughish above, rather downy beneath; figs single in the axils, pear-shaped, luscious.

F. elástica, INDIA-RUBBER-TREE of E. Indies (not that of S. America): tree cult. in conservatories for its beautiful leaves, 6′–10′ long, oval-oblong, entire, thick, smooth, bright green, glossy above.

F. rèpens, from China, a delicate creeping species, fixing itself firmly by rootlets and covering walls in conservatories; leaves 1′ or less long, oblong-ovate, with unequal partly heart-shaped base.

5. MÒRUS, MULBERRY. (Old Greek and Latin name.) Leaves heart-shaped or ovate, mostly serrate, often palmately lobed; short catkin-like spikes axillary or lateral; fl. spring: fruit in summer, eatable.

M. rùbra, RED MULBERRY. Low tree, wild in rich woods or along streams; leaves rough above, downy beneath, pointed; spikes often dicœcious, fruit cylindrical, red, turning dark purple.

M. nìgra, Black M. Middle-sized tree, planted and sparingly run wild from the Levant; leaves rough; spikes short and short-peduncled; fruit short-oblong or globular, red turning black, pleasant-tasted.

M. álba, White M. Small tree, planted from China: the leaves feed silk-worms, these are smooth and mostly oblique at base; spikes slender-peduncled, in fruit oval or oblong, white or pale rose-color, rather insipid.

6. BROUSSONÈTIA, PAPER-MULBERRY. (Named for *Broussonet*, a French naturalist.)

B. papyrífera, of Japan. Cult. as a shade-tree from New York S.: spreading by suckers, with a very fibrous bark; leaves rough above, downy beneath, serrate, some of them ovate or slightly heart-shaped, others 3-cleft or variously lobed: flowering in spring.

7. MACLÙRA, OSAGE-ORANGE. (Named for the late *Mr. Maclure*, founder of the Academy of Natural Sciences, Philadelphia.)

M. aurantìaca, Common O., or Bois d'arc (Bow-wood, the tough yellow wood used for bows by the Indians). Low bushy tree from Arkansas, &c.: multiplying rapidly by its running roots; planted for hedges, especially W.; armed with slender and very sharp spines; leaves lance-ovate, entire, very glossy: fl. spring.

8. URTÌCA, NETTLE. (The classical Latin name.) Common in waste grounds and near dwellings: fl. summer.

* *Flower-clusters in branching panicled spikes: often diœcious.* ♃

U. dioìca, Common N. A weed from Eu., full of stings, 2° – 3° high, with heart-ovate very deeply serrate leaves downy beneath.

U. grácilis. Fence-rows, &c.: 2° – 6° high, with ovate-lanceolate less deeply serrate leaves, longer petioles, rather few stings, and slender spikes.

* * *Flower-clusters shorter than the petiole, most'y 2 in the same axil, containing both sorts of flowers: stings scattered.* ①

U. chamædryoìdes. Wild S. & W.: slender, with heart-ovate or lance-ovate leaves moderately toothed, and dense flower-clusters.

U. ùrens, Small N. Weed from Eu., not common: 8′ – 12′ high, with ovate leaves deeply cut into long spreading teeth; flower-clusters small, loose.

9. LAPÓRTEA, WOOD-NETTLE. (Named for one *Laporte.*) ♃

L. Canadénsis. Moist and rich woods: 2° – 3° high; ovate leaves 4′ – 7′ long and long-petioled, a single 2-cleft stipule in the axil: fl. all summer.

10. BŒHMÈRIA, FALSE-NETTLE. (Named for *Prof. Böhmer* of Germany.) ♃

B. cylíndrica. Moist shady grounds, 1° – 3° high, smoothish; leaves mostly opposite, ovate or lance-ovate, 3-nerved, serrate, long-petioled; flower-clusters crowded in long narrow interrupted spikes, in summer.

B. nívea, Ramie, or the Grass-Cloth Plant of China, &c., 3° – 4° high, with ovate leaves white-downy beneath, is recently planted S. W. for its very valuable textile fibres.

11. CÁNNABIS, HEMP. (The ancient name.) Fl. all summer. ①

C. sativa, Common Hemp. Tall coarse plant from the Old World: cult. for the fibres of its stem.

12. HÙMULUS, HOP. (Name said to be a diminutive of *humus*, the ground; the application not apparent.) Fl. summer. ♃

H. Lùpulus, Common Hop. Wild in alluvial soil N. & W.: also cult. from Eu. for hops: the aromatic bitterness resides in the yellow resinous grains which appear on the fruiting calyx, akenes, &c.; stems almost prickly downwards; leaves heart-shaped and strongly 3 – 7-lobed.

104. PLATANACEÆ, PLANE-TREE FAMILY.

This order, if it may be so called, consists merely of the small genus

1. PLÁTANUS, PLANE-TREE. (The ancient name of the Oriental species, from the Greek word for *broad*, alluding either to the leaves or the wide-spreading branches.) Flowers monœcious, in separate naked heads hanging on slender peduncles; the sterile of many short stamens with club-shaped little scales intermixed; the fertile of club-shaped or inversely pyramidal ovaries mixed with little scales and tipped with a slender awl-shaped simple style, ripening into a sort of akene with a tawny-hairy contracted base. No evident calyx. Leaves alternate, palmately lobed or angled, the hollowed base of the petiole covering and concealing the axillary bud (Lessons, p. 28, fig. 74): stipules sheathing, like those of the Polygonum Family. Fl. spring.

P. occidentàlis, AMERICAN PLANE, SYCAMORE, or BUTTONWOOD. Well-known large tree by river-banks, with white close bark separating in thin brittle plates; leaves truncate or heart-shaped at base, rather scurfy-downy until old, the short lobes sharp-pointed, and fertile heads solitary.

P. orientàlis, ORIENTAL PLANE, especially its var. ACERIFOLIA, seldom planted in this country, is very like ours, but has leaves more cut and sooner smooth, the heads larger.

105. JUGLANDACEÆ, WALNUT FAMILY.

Trees with alternate pinnate leaves, no stipules, and monœcious flowers; the sterile ones in catkins with an irregular calyx and several stamens; the fertile single or 2 or more in a cluster, with a 3–5-lobed calyx, the tube of which is adherent to the ovary. The latter is incompletely 2–4-celled, but has only a single ovule, erect from its base, and ripens into a large fruit, the bony inner part of which forms the nut, the fleshy at length dry outer part the husk. Seed 4-lobed, filled with the fleshy and oily embryo, the large and separated cotyledons deeply two-lobed and crumpled or corrugated.

1. JUGLANS. Sterile flowers in solitary catkins from the wood of the preceding year, each with 12–40 stamens on very short filaments. Fertile flowers on a terminal peduncle, with a 4-toothed calyx, 4 little green petals, and 2 club-shaped and fringed conspicuous stigmas. Husk of the fruit drying up without splitting. Bark and shoots resinous-aromatic and strong-scented. Buds several, one over the other, the uppermost far above the axil (Lessons, p. 31, fig. 78). Pith in plates. Leaflets numerous.
2. CARYA. Sterile flowers in clustered lateral catkins, with 3–10 almost sessile anthers. Fertile flowers 2-5 in a cluster on a terminal peduncle: no petals: stigmas 2 or 4, large. Husk of the fruit splitting into 4 valves and falling away from the smooth nut. Valuable timber and nut trees, with very hard and tough wood, and scaly buds single (Lessons, p. 27, fig. 73), from which are usually put forth both kinds of flowers, the sterile below and the fertile above the leaves.

1. JÙGLANS, WALNUT. (Name from *Jovis glans*, the nut of Jupiter.) Fl. spring: fruit ripe in autumn. Seed sweet and edible.

* *Native trees of the country: nut with very rough and furrowed surface, from which the dried husk does not fall away: seed very oily.*

J. cinèrea, BUTTERNUT or WHITE W. Middle-sized tree, mostly N.: stalks and shoots clammy-downy; leaflets downy, at least beneath, oblong-lanceolate, pointed, serrate; fruit oblong; nut with very rugged ridges.

J. nigra. Black W. Large tree, commoner W. & S.: stalks and shoots not clammy, minutely downy; leaflets smoothish, ovate-lanceolate, serrate; fruit spherical.

* * *Planted from the Old World: husk friable, separating when dry from the roundish and smoothish thin-shelled nut.*

J. règia, English Walnut, so called, but native of Asia: leaflets oval, entire, smoothish; fruit ripens sparingly in Middle States.

2. CÁRYA, HICKORY. (Greek name of the Walnut, applied to these North American trees.) Fl. in rather late spring: nuts fall in autumn.

§ 1. *Sterile catkins in a sessile cluster: leaflets* 13–15, *short-stalked: nut edible.*

C. olivæfórmis, Pecan-nut. Along rivers, from Illinois S.: leaflets oblong-lanceolate, taper-pointed; nut cylindrical-oblong, olive-shaped, the seed delicious.

§ 2. *Sterile catkins* 3 *or more together on a common peduncle: leaflets sessile or nearly so, of* 5–9 *or rarely* 11–13 *leaflets: nut globular or short-oval.*

* *Nuts sweet-tasted and edible (the hickory-nuts of the market); the husk splitting into* 4 *thick and hard valves: buds large, of about* 10 *scales.*

C. àlba, Shell-bark or Shag-Bark H. Commonest E.: bark of old trunks very shaggy, separating in rough strips; inner bud-scales becoming very large and conspicuous on the young shoot; leaflets 5, the 3 upper much larger and lance-obovate; nut white.

C. sulcàta, Western Shell-bark H. From Penn. W. & S.: differs from the foregoing in lighter-colored heart-wood, 7–9 leaflets more downy beneath, fruit with very thick husk 4-ribbed above the middle, and larger yellowish or dull-white nut (sometimes 2′ long) mostly with a point at both ends.

C. tomentòsa, Mocker-nut or White-heart H. Common E. & S.: bark rough, but not splitting off in strips; shoots and lower surface of the leaves woolly-downy when young; leaflets 7–9, lance-obovate, or the lower lance-oblong; fruit with very thick hard husk, and globular nut (not flattish on the sides) brownish, very thick-shelled, hardly fit to eat.

* * *Nuts bitter, in a rather thin and friable husk, which splits only at the top, or tardily to near the base: bark on the trunk close: bud-scales falling early.*

C. porcina, Brown H. or Pig-nut. Common N.: bark of trunk rough; bud-scales about 10, small; shoots and leaves nearly smooth; leaflets 5–7, obovate-lanceolate; fruit pear-shaped; nut oblong or oval, hard-shelled, seed at first sweet, then bitterish.

C. amàra, Bitter-nut. Moist or low grounds: bark of trunk smooth and very close; yellowish bud-scales about 6; shoots and leaves pubescent when young; leaflets 7–11, lanceolate or lance-oblong; fruit and white thin-shelled and tender nut globular; seed at first sweet, then very bitter.

C. aquática, Water H. River-swamps S. Small tree, with rough bark; bud-scales as in the last; leaflets 9–13, lanceolate, smooth; nut thin-shelled, 4-angular, flattish; seed very bitter.

106. CUPULIFERÆ, OAK FAMILY.

Trees or shrubs, with alternate and simple straight-veined leaves, very deciduous stipules, and monœcious flowers; the sterile in slender catkins (except in the Beech); the fertile solitary, clustered, or sometimes spiked, and furnished with an involucre which forms a cup or covering to the 1-celled 1-seeded nut. This nut comes from an ovary with 2 or more cells having one or two ovules hanging from the summit of each; but all except one cell and one ovule are abortive. There is a calyx adhering to the ovary, as is shown by the minute teeth crowning its summit. Seed filled by the embryo, which has thick and fleshy cotyledons.

§ 1. *Sterile flowers with a distinct* 4–7*-lobed calyx and* 3–20 *slender stamens: fertile flowers* 1–4 *in a cup or bur-like involucre.*

* *Sterile flowers clustered in slender catkins: their bracts inconspicuous or deciduous.*

1. QUERCUS. Stamens 3–12. Fertile flower only one in the bud-like involucre, which becomes a scaly cup. Stigma 3-lobed. Nut (acorn) terete, with a firm shell, from which the thick cotyledons do not emerge in germination. (Lessons, p. 122, fig. 388; p. 20, fig. 36, 37.)
2. CASTANEA. Stamens 8–20. Fertile flowers few (commonly 3) in each involucre, one or more ripening; stigmas mostly 6 or 7, bristle-shaped. Nuts coriaceous, ovoid, when more than one flattened on one or both sides, enclosed in the hard and thick very prickly bur-like at length 4-valved involucre. Cotyledons somewhat folded together and cohering, remaining under ground in germination.

* * *Sterile flowers in small heads on drooping peduncles.*

3. FAGUS. Calyx of sterile flowers bell-shaped, 5–7-cleft, containing 8–16 long stamens. Fertile flowers 2 together on the summit of a scaly-bracted peduncle; the innermost scales uniting form the 4-lobed involucre: ovary 3-celled when young, crowned by 6 awl-shaped calyx-teeth and a 3-cleft or 3 thread-like styles: in fruit a pair of sharply 3-sided nuts in the 4-cleft soft-prickly rigid involucre. Cotyledons thick, somewhat crumpled together, but rising and expanding in germination. (Lessons, p. 19, fig. 31–33.)

§ 2. *Sterile flowers consisting of a few short stamens partly adhering to the bract, and destitute of any proper calyx; the anthers* 1*-celled: fertile flowers in pairs under each bract of a head, spike, or short catkin, each with one or two bractlets, forming a foliaceous or sac-like involucre to the nut. Sterile catkins rather dense.*

4. CORYLUS. Scales of the sterile catkin consisting of a bract to the inside of which 2 bractlets and several stamens adhere. Fertile flowers in a little head, like a scaly bud: stigmas 2, long and red. Nut rather large, bony, wholly or partly enclosed in a leaf-like or tubular and cut-lobed or toothed involucre.
5. OSTRYA. Scales of the sterile catkin simple. Fertile flowers in a sort of slender catkin, its bracts deciduous, each flower an ovary tipped with 2 long slender stigmas and enclosed in a tubular bractlet, which becomes a bladdery greenish-white oblong bag, in the bottom of which is the little nut: these together form a sort of hop-like fruit.
6. CARPINUS. Sterile catkin as in Ostrya. Fertile flowers in a sort of slender loose catkin; each with a pair of separate 3-lobed bractlets, which become leaf-like, one each side of the small nerved nut.

1. QUÉRCUS, OAK. (The classical Latin name.) Flowers in spring; acorns ripe in autumn. All but one of the following species are natives of the country.

§ 1. *Annual-fruited Oaks, the acorns maturing the autumn of the first year, therefore on the wood of the season, usually in the axil of the leaves, out of which they are often raised on a peduncle: kernel commonly sweet-tasted: no bristles on the lobes or teeth of the leaves.*

* WHITE OAKS, *with lyrately or sinuately pinnatifid and deciduous leaves.*

+– *European tree, more or less planted eastward.*

Q. Ròbur, EUROPEAN or ENGLISH OAK. Belongs to the same section with our White Oak; but leaves smaller, not glaucous beneath, sinuate-lobed, but hardly pinnatifid; acorn oblong, over 1′ long, — one or a few in a cluster which is nearly sessile in the axils in var. SESSILIFLÒRA, — raised on a slender peduncle in var. PEDUNCULÀTA.

+– +– *Native species: leaves pale or whitish beneath.*

Q. álba, WHITE OAK. Rich soil: large tree with whitish bark; leaves soon smooth, bright green above, whitish beneath, with 3–9 oblong or linear obtuse and mostly entire oblique lobes; the shallow rough cup very much shorter than the ovoid-oblong (about 1′ long) acorn; seed edible.

Q. obtusíloba, POST OAK, ROUGH or BOX WHITE OAK. Small tree in barren soil, commonest S., with very durable wood; thickish leaves grayish

downy beneath, pale and rough above, sinuately 5–7-lobed, the lobes divergent and rounded, the upper pair larger and sometimes 1–3-notched; naked cup deep saucer-shaped, half or one third the length of the small acorn

Q. macrocárpa, Bur-Oak, Over-cup or Mossy-cup White Oak. Middle-sized tree in fertile soil, commonest W.: with obovate or oblong lyrately pinnatifid leaves, of various shape, pale or downy beneath, smooth above; cup deep, thick and woody, from hardly 1′ to 2′ in diameter, covered with hard and thick pointed scales, the upper ones tapering into bristly points, making a mossy-fringed border; acorn 1′–1½′ long, half or wholly covered by the cup.

Q. lyràta, Southern Overcup Oak. Large tree in river-swamps, from N. Car. S. & W.: leaves crowded at the end of the branchlets, obovate-oblong, with 7–9 triangular and entire acute lobes, glossy above, whitish-downy beneath; cup sessile, globular, rough with rugged scales, almost covering the globular nut.

* * Chestnut-Oaks, *with toothed or sinuate leaves, not lobed except slightly in the first species, white or whitish downy beneath: cup hoary, about half the length of the oblong-ovoid edible acorn.*

Q. bícolor, Swamp White Oak. Low grounds, chiefly N. & W.: tall tree, with leaves intermediate between the White and the Chestnut Oaks, being more or less obovate and sinuate-toothed, or some of them nearly pinnatifid, hoary with soft down beneath, wedge-shaped at base, the main veins only 6–8 pairs and not prominent; peduncle in fruit longer than the petiole; cup often mossy-fringed at the margin; acorn hardly 1′ long.

Q. Prinus, Chestnut Oak. The leading form is Swamp Chestnut Oak, in low grounds mainly S.; with obovate or oblong leaves wavy-toothed and minutely downy beneath, the main veins 10–16 pairs and prominent beneath; fruit-bearing peduncle short; the thick cup ½′–1′ wide, tubercled with the thick scales; acorn 1′ or less long. — Var. montícola, Rock Chestnut Oak, has large acorns like the above, but more the chestnut-like leaves of the next; grows in and near the mountains. — Var. acuminàta, Yellow Chestnut Oak of rich rather dry soil through the interior, mostly of the Middle States, has chestnut-like oblong or lanceolate leaves, mostly roundish at base, on slender petioles, equally and sharply toothed, and very straight-veined; cup about ½′ broad, its scales small and close; acorn rather small.

Q. prinoides, Dwarf Chestnut or Chinquapin-Oak. Barren or sandy soil, mostly E.: shrub 2°–4° high, with obovate or oblong sinuate leaves narrowed at base; and acorns and cup like those of true Chestnut Oak, but very much smaller; producing little abortive acorns in the axils of some of the scales of the cup.

* * * Live Oak, *with evergreen coriaceous leaves, not lobed.*

Q. vírens, Live Oak. Barrens or sands along the coast from Virg. S. Small or large tree, or a mere shrub, with very durable firm wood, the branchlets and lower face of the small oblong entire (or rarely spiny-toothed) leaves hoary; conspicuous peduncle bearing 1–3 small fruits, with top-shaped cup and oblong acorn.

§ 2. Biennial-fruited Oaks, *the acorns not maturing until the autumn of the second year, these therefore borne on old wood below the leaves of the season, on short and thick peduncles or none: kernel always bitter: tip or lobes of the leaves commonly bristle-pointed.*

* Thickish-leaved Oaks, *some of them almost or quite evergreen at the South, coriaceous but deciduous N., entire, sparingly toothed, or barely 3-lobed at the summit.*

+– *Leaves generally entire, not widened upwards: acorns spherical, small.*

Q. cinèrea, Upland Willow Oak. Dry pine-barrens, S. E. Virginia and S. Small tree or shrub; resembles Live Oak, but more downy, narrower-leaved, the cup shallow, and small acorn globular.

Q. Phéllos, Willow Oak. Sandy low woods from New York S.: a middle-sized tree, remarkable for its linear-lanceolate smooth willow-like leaves narrowed at both ends.

Q. imbricària, LAUREL or SHINGLE OAK. Rather sterile soil, from New Jersey W. & S. W.: a middle-sized tree, with laurel-like lance-oblong leaves glossy above, more or less downy beneath.

+– +– *Leaves widening upwards, where they are sometimes moderately 3–5-lobed: acorns globular, ovoid, small.*

Q. aquática, WATER OAK. Wet ground from Maryland S.: a small tree, with very smooth and glossy obovate-spatulate oblanceolate or wedge-oblong leaves long-tapering at base; cup saucer-shaped.

Q. nìgra, BLACK-JACK or BARREN OAK. Barrens, from New York S. & W.: low tree (8°–25° high), with wedge-shaped leaves widely dilated and mostly 3-lobed at summit, but often rounded at the narrow base, rusty-downy beneath, smooth and glossy above; cup top-shaped, coarse-scaly.

* * BLACK and RED OAKS, *with long-petioled and sinuate-lobed or pinnatifid deciduous leaves.*

+– *Downy beneath even when mature: cup saucer-shaped with top-shaped base.*

Q. ilicifòlia, BEAR or BLACK SCRUB-OAK. Sterile hills and barrens, mostly N. & W.: shrub 3°–8° high, straggling; leaves obovate with wedge-shaped base, above angularly 3–7-lobed, whitish-downy beneath; acorn ovoid, barely ½′ long.

Q. falcàta, SPANISH OAK. Dry soil, New Jersey to Ill. and S.: large tree, with oblong leaves obtuse or rounded at base, 3–5-lobed above, grayish or yellowish-downy beneath, the lobes mostly narrow and entire or sparingly toothed and somewhat curved; acorn globular, hardly ½′ long.

+– +– *Mature leaves smooth on both sides or nearly so, generally ovate, oblong, or some of the larger obovate in outline, and varying from sinuately to deeply pinnatifid, turning various shades of red or crimson in late autumn: wood coarse-grained.*

++ *Leaves with wedge-shaped base and short petiole, rather thick and coriaceous.*

Q. Catesbæi, TURKEY or BARRENS SCRUB-OAK. Small tree in pine barrens S.: leaves deeply pinnatifid or 3–5-cleft, the long and narrow or unequal lobes somewhat scythe-shaped and often nearly entire; cup very thick and of coarse scales, 1′ or less broad, half enclosing the ovoid nut.

++ ++ *Leaves mostly rounded or obtuse at the base, slender-petioled, thinner.*

Q. coccínea, SCARLET OAK. Dry or barely moist soil: large tree, with gray bark, the interior reddish, rather firm leaves more or less glossy above and deeply pinnatifid; cup coarse-scaly, top-shaped or hemispherical with a conical scaly base, covering half or more of the roundish acorn (this ½′–¾′ long).

Var. **tinctòria,** QUERCITRON, YELLOW-BARKED, or BLACK OAK. Bark of trunk darker-colored, thicker, rougher, internally orange (quercitron), and much more valuable to the tanner and dyer; cup less top-shaped; leaves less pinnatifid or some of them barely sinuate, thinner, less glossy, and more like those of the next.

Q. rùbra, RED OAK. Common in rich and poor soil: large tree, with dark gray smoothish bark, very coarse reddish wood, and thinnish moderately pinnatifid leaves; cup saucer-shaped, sessile or on a short and abrupt narrow neck, of fine close scales, very much shorter than the nearly oblong acorn (this 1′ or less in length).

Q. palústris, SWAMP SPANISH or PIN OAK. Low grounds, only N.: middle-sized tree, with less coarse wood, deeply pinnatifid smooth leaves with their divergent lobes separated by broad and rounded sinuses; cup flat-saucer-shaped with a short scaly base or stalk, of fine scales, very much shorter than the roundish acorn, which is barely ½′ in length.

2. CASTÀNEA, CHESTNUT. (Classical name, taken from that of a town in Thessaly.) Flowers in summer, appearing later than the elongated strongly straight-veined and merely serrate leaves.

C. vésca, EUROPEAN CHESTNUT: seldom planted: large tree, with oblong-lanceolate pointed leaves beset with coarse sharp-pointed teeth, when mature smooth and green both sides; nuts 2 or 3 in each involucre.

Var. **Americàna,** AMERICAN CHESTNUT: large tree in hilly woods, from Canada to Florida, distinguishable from the European only by leaves acute at the base, and nuts sweeter and smaller.

C. pùmila, CHINQUAPIN. Sandy dry soil chiefly S. & E.: shrub or small tree; with lance-oblong leaves whitish downy beneath, and very sweet nut solitary in the involucre, therefore terete.

3. FÀGUS, BEECH. (Classical Latin name, from the Greek, alluding to the nuts being good to eat.) Flowers appearing with the (straight-veined and serrate) leaves, in spring.

F. ferrugínea, AMERICAN BEECH. Forest tree, commoner N., with fine-grained wood, close and smooth light gray bark, and light horizontal spray; the leaves oblong-ovate and taper-pointed, distinctly toothed, thin, their silky hairs early deciduous, the very straight veins all ending in the salient teeth.

F. sylvática, EUROPEAN BEECH, occasionally planted as a shade-tree, is distinguished by broader and shorter, firmer, more hairy, and wavy-toothed leaves, some of the main veins tending to the sinuses. COPPER BEECH is a variety with crimson-purple foliage.

4. CÓRYLUS, HAZEL-NUT, FILBERT. (Classical Latin name.) Shrubs, with flowers in early spring, preceding the rounded-heart-shaped, doubly-serrate, at first downy leaves. Edible nuts ripe in autumn.

C. Avellàna, EUROPEAN H. or FILBERT. Occasionally planted: 6° – 10° high, with bristly shoots, and smoothish deeply-cleft involucre about the length of the (1′ long) oval nut.

C. Americàna, AMERICAN H. Thickets. 4° – 6° high, with more downy shoots, leaves, and involucre, the latter open down to the smaller globular nut in the form of a pair of broad cut-toothed leafy bracts.

C. rostràta, BEAKED H. Thickets and banks, mostly N.: 2° – 5° high, with more ovate and scarcely heart-shaped leaves, the densely bristly involucre prolonged in a narrow curved tube much beyond the ovoid nut.

5. ÓSTRYA, HOP-HORNBEAM. (Classical name.) Slender trees, with very hard wood: flowers appearing with the (Birch-like) leaves, in spring.

O. Virgínica, AMERICAN H., IRON-WOOD or LEVER-WOOD. Rich woods: tree 30° – 50° high, with brownish rough bark, and oblong-ovate taper-pointed sharply doubly serrate leaves downy beneath, the sacs of the fruit bristly at base.

6. CARPÌNUS, HORNBEAM, IRON-WOOD. (Ancient Latin name.) Low trees or tall shrubs, with furrowed trunks and very hard wood, the close gray bark and small leaves resembling those of the Beech; flowers with the leaves, in spring.

C. Americàna, AMERICAN H., also called BLUE or WATER BEECH. Banks of streams: 10° – 20° high; with ovate-oblong pointed doubly serrate leaves, becoming smooth, and halberd-3-lobed bracts of the involucre.

107. MYRICACEÆ, SWEET-GALE FAMILY.

Shrubs, with resinous-dotted often fragrant simple leaves, and monœcious or diœcious flowers, both kinds in short scaly catkins or heads, and destitute of any proper calyx, the 1-seeded fruit a fleshy little drupe or at length dry nut, commonly coated with wax.

1. MYRICA. Flowers mostly diœcious, the catkins from lateral scaly buds: each flower under a scale-like bract and with a pair of bractlets; the sterile of 2 – 8 stamens; the fertile of an ovary bearing 2 slender stigmas and surrounded by a few little scales.
2. COMPTONIA. Flowers mostly monœcious, the sterile in cylindrical catkins; the fertile in globular bur-like heads. Ovary surrounded by long awl-shaped scales which persist around the smooth little nut.

1. MYRÌCA, BAYBERRY, SWEET GALE. (Ancient name of some aromatic shrub.) Fl. spring, with or earlier than the leaves.

M. Gàle, SWEET GALE. Cold bogs N.: 1°–4° high, with pale wedge-lanceolate leaves, serrate towards the apex; little nuts crowded, and as if winged by a pair of scales.

M. cerífera, BAYBERRY, WAX-MYRTLE. Along the coast: shrub 2°–8° high, with fragrant lance-oblong or lanceolate mostly entire leaves, becoming glossy above, the scattered bony nuts thickly incrusted with greenish or white wax and appearing like berries.

2. COMPTÒNIA, SWEET-FERN. (Named for *Henry Compton*, a bishop of London.) Flowers rather later than the leaves, in spring.

C. asplenifòlia, the only species, in sterile rocky soil, chiefly E.: 1°–2° high, with linear-lanceolate downy leaves pinnatifid into many short and rounded lobes, resembling a Fern, and sweet-aromatic.

108. BETULACEÆ, BIRCH FAMILY.

Trees or shrubs, often resinous-sprinkled and aromatic, with alternate, simple, mostly straight-veined leaves, commonly deciduous stipules, and monœcious flowers, both kinds in scaly catkins, and 2 or 3 under each bract. Ovary 2-celled and 2-ovuled, but the fruit (a little nut or akene often surrounded by a wing like a samara) 1-celled and 1-seeded. Stigmas 2, thread-like.

1. BETULA. Sterile catkins long and hanging: 3 flowers under each shield-shaped scaly bract, each with a scale bearing 4 short stamens with 1-celled anthers. Fertile catkins stout: 2 or 3 flowers under each 3-lobed bract, each of a naked ovary ripening into a rounded broadly winged scale-like little key-fruit, tipped with the 2 stigmas.
2. ALNUS. Flowers much as in Betula: but usually a distinct 3–5-parted calyx; anthers 2-celled; oval fertile catkins composed of thick and at length woody persistent scales; and the little nutlets less winged or wingless.

1. BÉTULA, BIRCH. (The ancient Latin name.) Trees with slender spray (or a few low shrubs), more or less spicy-aromatic twigs, sessile scaly buds, flowers in early spring along with the leaves; the sterile catkins golden yellow; the fertile ones mostly terminating very short 2-leaved branches of the season. The following are all native trees.

* *Trunk with brown or yellow-gray bark, the inner and the twigs and thin straight-veined leaves spicy-aromatic: petioles short: thick fruiting catkins with their thin scales rather persistent: fruit with narrow wing.*

B. lénta, SWEET, BLACK, or CHERRY BIRCH. Moist woods mostly N.: a rather large tree, with fine-grained valuable wood, dark brown close bark on the trunk (not peeling in thin layers) and bronze-reddish twigs, very aromatic; leaves oblong-ovate and somewhat heart-shaped, sharply doubly serrate all round, soon glossy above and almost smooth; fruiting catkins oblong-cylindrical.

B. lùtea, YELLOW or GRAY B. With the other and more northward: less aromatic; bark of trunk yellowish-gray and somewhat silvery, separating in filmy layers; leaves duller, more downy, and rarely at all heart-shaped; fruiting catkins short-oblong.

* * *Trunk with chalky-white bark peeling horizontally in thin sheets: leaves and narrow cylindrical smooth catkins slender-stalked: bracts falling with the broad-winged fruit.*

B. álba, var. **populifòlia,** AMERICAN WHITE BIRCH. Small tree in low or sterile soil, from Penn. N. E., 15°–25° high, with triangular very taper-pointed smooth and glossy leaves.

B. papyràcea, PAPER or CANOE BIRCH. Large tree, from upper part of Penn. N., mostly far N.; with more ovate and even heart-shaped leaves (dull

beneath, and even dark green above), and more papery bark than in White Birch, separating in ample sheets.

* * * *Trunk with greenish-brown bark, hardly peeling in layers, reddish twigs little aromatic, and oblong downy short-stalked catkins : wings of fruit broad.*

B. nigra, River or Red Birch. Middle-sized tree of low river-banks, commonest S. : leaves rhombic-ovate, whitish and mostly downy beneath.

2. ÁLNUS, ALDER. (Ancient Latin name.) Small trees or shrubs, with narrow leaf-buds of very few scales and often stalked, and catkins mostly clustered or racemed on leafless branchlets or peduncles.

§ 1. *Flowers with the leaves in spring, the sterile from catkins which were naked over winter, while the fertile catkin was enclosed in a scaly bud.*

A. víridis, Green or Mountain Alder. Only rather far N., and on mountains : 3°–8° high ; leaves round-oval or ovate, glutinous ; fruit with a broad thin wing.

§ 2. *Flowers in earliest spring, much before the leaves, both sorts from catkins which have remained naked over winter : wing of fruit narrow and thickish.*

A. serrulàta, Smooth A. Common, especially S. : 6°–12° high, with obovate smooth or smoothish leaves green both sides and sharply serrate.

A. incàna, Speckled or Hoary A. Common N. along streams : 8°–20° high ; with broadly oval or ovate leaves rounded at base, serrate and often coarsely toothed, whitened and commonly downy beneath.

109. SALICACEÆ, WILLOW FAMILY.

Trees or shrubs, with bitter bark, soft light wood, alternate undivided leaves, either persistent or deciduous stipules, and dicœcious flowers ; both kinds in catkins, one flower under each bract or scale, the staminate of naked stamens only ; the fertile of a 1-celled ovary which becomes a 2-valved pod with 2 parietal or basal placentæ, bearing numerous seeds furnished with a tuft of long cottony down at one end.

1. SALIX. Scales of the catkins entire. Sterile flowers of few or rarely many stamens, accompanied by 1 or 2 little glands. Fertile flowers with a little gland at the base of the ovary on the inner side: stigmas 2, short, each sometimes 2-lobed. Shrubs or trees with lithe branches, mostly 1-scaled buds, and narrow leaves.
2. POPULUS. Scales of the catkins cut or cleft at the apex. Flowers on a cup-shaped oblique disk. Stamens usually numerous. Stigmas long. Catkins drooping; flowers preceding the leaves, these mostly broad. Buds scaly.

1. SÀLIX, WILLOW, OSIER. (The classical Latin name.) The Willows, especially the numerous wild ones, are much too difficult for the beginner to undertake. For their study the Manual must be used. The following are the common ones planted from the Old World, with some of the most tree-like wild ones.

§ 1. *Stamens 2, but their filaments and often the anthers also united into one.*

S. purpùrea, of Eu. : known by the reddish or olive-colored twigs, lateral catkins before the leaves and with dark scales, red anthers, and sessile downy ovary.

§ 2. *Stamens 2 and separate.*

* *Flowers earlier than the leaves : catkins sessile along the shoot of preceding year.*

S. viminàlis, Basket W. or Osier, of Eu., the twigs best for basket-work ; has lance-linear entire slender-pointed leaves 3′–6′ long and satiny-white underneath.

* * *Flowers slightly earlier than the leaves but rather late in spring, on lateral catkins which have* 4 *or* 5 *leafy bracts at their base.*

S. cordàta. A common wild species along streams, badly named, as the leaves are seldom heart-shaped at base and generally lanceolate, often tapering to both ends, sharply serrate, smooth, pale or whitish beneath ; stipules on young shoots conspicuous, ovate or kidney-shaped ; ovary slender-stalked, tapering, smooth.

* * * *Flowers in loose catkins terminating leafy lateral shoots of the season, therefore later than the leaves, in late spring or early summer.*

S. longifòlia, Long-leaved W. Wild on river-banks N. : low shrub or low tree, with very long lance-linear nearly sessile sparsely denticulate leaves grayish-hairy when young ; catkins with narrow yellowish scales ; the stalked silky-downy ovary bearing large stigmas.

S. Babylónica, Weeping W. Planted from the Orient : a familiar tree, with very slender drooping branches, and linear-lanceolate leaves white beneath ; in the monstrous variety called annulàris, Hoop W., curved into a ring.

S. álba, White W., commonly the var. vitellìna, with yellow twigs : planted from Eu. ; a familiar tree ; leaves lanceolate, serrate, white-silky underneath ; stipules lanceolate ; ovary nearly sessile and smooth.

S. frágilis, Brittle W., from Eu. (so called because the twigs, used for basket-work, &c., break off readily from their base, as in several other species) ; large tree, with lanceolate taper-pointed leaves white but smooth beneath, half heart-shaped stipules, and nearly sessile smooth ovary.

§ 3. *Stamens* 3 – 5 *or more, separate : catkins late-flowering, terminating leafy branches of the season as in the preceding species : stamens hairy : ovary smooth : scales deciduous : leaves serrate, smooth.*

S. nigra, Black W. Low river-banks : wild tree, with rough black bark, narrow-lanceolate taper-pointed leaves, 3 – 6 stamens, and short-ovate pods.

S. pentándra, Bay W. A handsome tree, planted from Eu. for the deep green very glossy lanceolate taper-pointed leaves, of the same hue both sides, the large staminate catkins of golden yellow flowers also handsome : stamens 4 – 12, commonly 5 ; pods tapering.

S. lùcida, American Bay W. Wild in wet ground N : very like the last, but a shrub, with shorter catkins on a less leafy short branch.

2. PÓPULUS, POPLAR, ASPEN. (Classical Latin name.) Fl. spring.

§ 1. *Buds not glutinous : leaves cottony, at least beneath, even when old.*

P. álba, Abele or White P. Tree planted from Eu., with spreading branches, roundish slightly heart-shaped wavy-toothed or lobed leaves soon green above, very white-cottony beneath : spreads inveterately by the root.

§ 2. *Buds not glutinous : leaves cottony when developed, but soon smooth and green both sides : bark smooth and close, greenish-white.*

P. tremuloìdes, American Aspen. Small tree, common in woods N. ; with small roundish-heart-shaped leaves beset with small regular teeth ; scales of the catkin cut into 3 or 4 linear lobes, fringed with long hairs.

P. grandidentàta, Larger American Aspen. Middle-sized tree, common in woods : the larger roundish-ovate leaves with coarse and irregular blunt teeth ; scales unequally 5 - 6-cleft, slightly fringed.

P. heterophýlla, Downy Poplar. Wet grounds, common only W. & S. : tree 40° – 60° high ; leaves round-ovate or heart-shaped with the sinus closed by the overlapping lobes, obtuse, serrate with incurved teeth, 3′ – 5′ long, white wool deciduous only with age, leaving traces on the veins beneath and on the petioles ; fruiting catkins smooth.

§ 3. *Buds glutinous with aromatic resin or balsam : leaves smooth from the first.*

P. dilatàta, Lombardy P. Stiff spiry tree, with closely appressed branches, and small broadly triangular pointed leaves, formerly much planted, from the Old World, — thought to be a remarkable state of

P. nigra, Black P., of Eu., which is occasionally planted, and has spreading branches, larger leaves, more glutinous buds, &c.

P. monilífera, Cotton-wood or Necklace P. Along the Great Lakes and rivers, from L. Champlain W. and S. W. : large tree, with young branches somewhat angled; leaves dilated-triangular or slightly heart-shaped, taper-pointed, serrate with cartilaginous incurved teeth and prominent lateral veins; fertile catkins very long and interrupted, their scales cut-fringed; stigmas very large, toothed.

P. balsamífera, Balsam P. or Tacamahac. Middle-sized tree, wild along our Northern borders and N. W. : has round or scarcely angled branchlets, very glutinous and pleasantly balsamic strong-scented bud-scales, and ovate or lance-ovate gradually tapering leaves.

Var. **cándicans,** Balm-of-Gilead P.: planted around dwellings as a shade tree, wild in some places, spreading inveterately from the root; appears to be a variety of the Balsam Poplar, with broader ovate and often heart shaped leaves lighter-colored beneath.

Subclass II. GYMNOSPERMOUS: no closed ovary, style, or stigma, but ovules and seeds naked on a scale or some other sort of transformed leaf, or in Yew at the end of a scaly-bracted stalk; the mouth of the ovule receiving the pollen directly. (Lessons, p. 109, fig. 337–339; p. 125, fig. 411–413.) Leaves not netted-veined.

Cýcas revolùta (Lessons, p. 26, fig. 71), from the southern part of Japan, a palm-like low tree of conservatories, wrongly called Sago Palm, and

Zámia integrifòlia, the Coontie of Florida, the root-like trunk of which does not rise above ground, and furnishes a kind of flour called Florida Arrow-root, represent the order Cycadaceæ.

111. CONIFERÆ, PINE FAMILY.*

Trees or shrubs, with wood of homogeneous fibre (no ducts), resinous juice, commonly needle-shaped or awl-shaped leaves, and monœcious or sometimes dicœcious flowers destitute of both calyx and corolla, and in catkins or the like. (See Lessons, as above.)

I. PINE FAMILY proper. These are true *Coniferæ*, or cone-bearing trees, the fertile flowers being in a scaly catkin which becomes a strobile or scaly cone. The scales are each in the axil of a bract (which is sometimes evident and projecting, but often concealed in the full-grown cone), and bear a pair of ovules adhering to their inner face next the base, the orifice downwards, and the two winged seeds peel off the scale as the latter expands at maturity. They all have scaly buds. All the common and hardy trees of the family belong to the following.

1. PINUS. Leaves persistent, long and needle-shaped, 2, 3, or 5 in a cluster from the axil of dry bud-scales, developed after the scaly shoot of the season lengthens. Sterile catkins clustered at the base of the shoot of the season; each stamen answers to a flower, reduced to a 2-celled anther, with hardly any filament. Cone woody, mostly large, maturing in the autumn of the second year. Cotyledons of the embryo several. (See Lessons, p. 24, fig. 56, 57; p. 63, fig. 185; p. 125, fig. 411–413.)

* For a particular account of the numerous trees of this noble family now planted or beginning to be planted for ornament special works should be consulted, such, especially, as the recent "Book of Evergreens," by Mr. Hoopes. We give here only the principal species of the country, east of the Mississippi, and the *well-established* introduced species, mainly such as are fully hardy North.

2. ABIES. Leaves persistent, linear or short needle-shaped, borne directly on the shoots of the season, over which they are thickly and uniformly scattered. Sterile catkins in the axils of the leaves of the preceding year. Fertile catkins solitary, maturing in the autumn of the same year; their scales thin and even, never prickle-bearing.

3. LARIX. Leaves all deciduous in autumn, soft, short needle-shaped, in spring, developed very many in a dense cluster from axillary buds of the previous summer (Lessons, p. 68, fig. 184), those on shoots of the season similar but scattered. Cones as in Abies, the scales persistent.

4. CEDRUS. Leaves as in Larix, but rigid and persistent. Cones globular, large, of very broad thin scales, which at length fall away from the axis.

II. CYPRESS FAMILY. These have both kinds of flowers in short often globular catkins of few scales; the fertile making a globular or ovate small cone, which is often fleshy when young, sometimes imitating a berry. The branches appear and the shoots grow on without the intervention of any scaly buds. Leaves often opposite or whorled, sometimes scale-like and adnate to the branch.

§ 1. *Scales of the globular cone with a pointed bract behind each wedge-shaped scale, partly cohering with its back.*

5. CRYPTOMERIA. Cone terminating a leafy branch, the recurved tip of the bract and awl-shaped lobes of the top of the scales projecting.

§ 2. *Scales of the fruit simple, no bract behind them.*

* *Fruit a sort of cone, dry and hard when mature: flowers monœcious, rarely diœcious.*

+– *Leaves thin and delicate, flat, deciduous.*

6. TAXODIUM. Two kinds of flowers on the same branches; the sterile catkin spike-panicled, of few stamens; the fertile in small clusters. Cone globular, firmly closed till mature, of several very thick-topped and angular shield-shaped scales, a pair of erect 3-angled seeds on their stalk.

+– +– *Leaves evergreen, linear and awl-shaped, alternate, free, destitute of glands.*

7. SEQUOIA. Catkins globular, the scales of the fertile ones bearing several ovules. Cone woody; the shield-shaped scales closed without overlapping, and bearing 3–5 flat wing-margined seeds hanging from the upper part of their stalk-like base.

+– +– +– *Leaves evergreen, opposite, awl-shaped and scale-shaped (the former on the more vigorous lengthening shoots, the latter closely imbricated and decussate on the succeeding branchlets), commonly with a resinous gland on the back. Seeds and ovules erect: cotyledons only 2 or 3.*

8. CUPRESSUS. Cones spherical; the shield-shaped scales closing by their well-fitted margins, not overlapping, separating at maturity, each scale bearing two or usually several ovules and winged or wing-margined seeds, its broad summit with a central boss or short point.

9. THUJA. Cones oblong or globular, the scales not shield-shaped but concave and fixed by their base, overlapping in pairs, pointed if at all from or near their summit, spreading open at maturity, each bearing a single pair of ovules and seeds, or rarely more.

* * *Fruit berry-like: flowers commonly diœcious.*

10. JUNIPERUS. Catkins very small, lateral; the fertile of 3–6 fleshy scales growing together, and ripening into a sort of globular berry, containing 1–3 bony seeds. Leaves evergreen, opposite or whorled.

III. YEW FAMILY. Distinguished by having the fertile catkin, if it may be so called, reduced to a single terminal flower, consisting of an ovule only, surrounded by some bracts, ripening into a nut-like or drupe-like seed: cotyledons only 2. There is nothing answering to the scales of a pine-cone. Leaf-buds scaly as in the true Pine Family. Flowers mostly diœcious, axillary.

11. TAXUS. Leaves linear, appearing more or less 2-ranked, green both sides. Both kinds of catkins, if such they may be called, are small axillary buds

imbricated with persistent scales, bearing at the apex, one a few naked stamens, each with 3–8 anther-cells under a somewhat shield-shaped apex, the other an ovate ovule. This in fruit becomes a nut-like blackish seed, resting in the bottom of a berry-like red cup.

12. TORREYA. Leaves, catkins, &c., nearly as in Taxus. Stamens more scale-shaped at top, each bearing 4 hanging anther-cells. Naked seed resembling a thin fleshed drupe or when dry a nut, with no cup around it, as large as a nutmeg, which it resembles also in the brain-like interior structure.

13. SALISBURIA. Leaves wedge-shaped and fan-shaped, deeply 2-cleft and the lobes wavy-toothed and somewhat cleft at the broad truncate end, traversed with straight simple or forking nerves or veins, like a Fern. Flowers not often seen. Sterile catkins slender and loose. Seed drupe-like, and with a fleshy short cup around its base.

PODOCARPUS, one or two species in choice conservatories, and two half hardy in the Middle States as low shrubs, — the genus so called because the fleshy seed is raised on a sort of stalk, — belongs here. The leaves are sometimes much unlike those of other Coniferous trees, being large, linear, lanceolate, or even ovate, and veinless, except the midrib.

1. PÌNUS, PINE. (The classical Latin name.) Flowers in late spring.

§ 1. PITCH-PINES *and their relatives, with leaves only* 2 *or* 3 *in the cluster, scaly-sheathed at the base : wood resinous.*

* *Cones lateral and persistent on the branch long after shedding the seed, the scales thickened at the end, often tipped with a cusp or spine : leaves rigid.*

+– *Leaves* 3 *in the cluster. All natives, but the last Californian.*

P. australis, LONG-LEAVED or SOUTHERN YELLOW PINE. Lofty striking tree, of pine-barrens from N. Car. S. ; with leaves 10′–15′ long, very resinous wood, and cones 6′–10′ long, the scales tipped with a reflexed short spine.

P. tæda, LOBLOLLY or OLD-FIELD P. Smaller tree, in light soil, from Virginia S , with less resinous wood, dark green leaves 6′–10′ long, and solitary cones 3′–5′ long, the scales tipped with a short straight or incurved spine.

P. rígida, NORTHERN PITCH P. Sandy or thin rocky soil, abounding along the coast N. and in the upper country S. : a stout tree, with dark green leaves 3′–5′ long from short sheaths, clustered ovate-conical cones 2′–3′ long, the scales tipped with a recurved spine or prickle.

P. serótina, POND P. Small tree in wet ground from N. Car. S. ; with valueless wood, leaves 4′–8′ long, and mostly opposite round-ovate cones 2′–3′ long, their scales tipped with a very small and weak prickle.

P. ponderòsa (or BENTHAMIÀNA) ; planted from California, where it is a characteristic tree, with heavy wood, deep green leaves 6′–11′ long, and clustered cones about 3′ long, reflexed on a short stalk.

+– +– *Leaves only* 2 *in the sheath, or a few of them sometimes in threes.*

++ *Planted from Europe.*

P. sylvéstris, SCOTCH PINE (wrongly called also *Scotch Fir*), the common Pine of N. Europe : middle-sized tree, known by the bluish-white hue of its flat leaves (2′–4′ long), reddish bark on the trunk, and narrow tapering cones, the scales with tubercle-like tips.

P. Austriaca, AUSTRIAN P., a probable variety of P. LARÍCIO, or CORSICAN P. of S. Eu. : a fast-growing massive tree, with very rough branches, dark-green slender but rigid leaves 4′–6′ long, and conical cones 2½′–3′ long.

++ ++ *Wild species of the country.*

P. púngens, TABLE-MOUNTAIN or PRICKLY PINE. Along the Alleghanies from Penn. to S. Car. : middle-sized tree ; with dark bluish-green leaves only about 2′ long ; but the heavy and clustered cones fully 3′ long, ovate, and the scales armed with a very strong somewhat hooked spine.

P. mitis, YELLOW PINE of the North, SHORT-LEAVED YELLOW PINE S. : a middle-sized tree in sandy or dry soil, with firm fine-grained wood, slender leaves (not rarely in threes) 3′–5′ long, and mostly solitary ovate or oblong-conical cones barely 2′ long, the scales tipped with a minute weak prickle.

P. ínops, Jersey Scrub P. Low straggling tree of barrens and sterile hills, from New Jersey S. & W.; with drooping branchlets, leaves 1′–3′ long, and solitary ovate-oblong cones 2′ long, reflexed on a short stalk, the scales tipped with an awl-shaped prickle.

P. Banksiàna, Gray or Northern Scrub P. Along our northern frontiers and extending N., on rocky banks: straggling shrub or tree, 5°–20° high; with oblique or contorted leaves 1′ long, curved cones barely 2′ long, and blunt scales.

* * *Cones at the apex of the branch and falling after shedding the seed, their scales slightly thickened at the end and without any prickly point; leaves only 2 in the cluster and with a long sheath, slender.*

P. resinòsa, Red Pine, and wrongly called Norway Pine: the Latin name not a good one, as the tree is not especially resinous: dry woods N. from N. England to Wisconsin; 50°–80° high, with reddish and smoothish bark, compact wood, dark green leaves 5′–6′ long and not rigid, and ovate-conical smooth cones about 2′ long.

§ 2. White Pines, *with softer leaves, 5 in the cluster, their sheath and the scale underneath early deciduous: cones long, cylindrical, terminal, hanging, falling after shedding the seeds, their scales hardly if at all thickened at the end, pointless: seed thin-shelled and winged.*

P. Stróbus, White Pine. Tall tree in low or fertile soil N. and along the mountains; with soft white wood invaluable for lumber, smooth greenish bark on young trunks and branches, pale or glaucous slender leaves 3′–4′ long, and narrow cones 5′–6′ long.

P. excélsa, Bhotan or Himalayan White P. Ornamental tree barely hardy for N.; with the drooping and white leaves and the cones nearly twice the length of those of White Pine.

P. Lambertiàna, Lambert's or Sugar P. One of the tallest trees of Oregon and California, beginning to be planted: has leaves as rigid as in many Pitch Pines, 3′–5′ long, bright green, the cones also at first erect, when full grown 12′–20′ long.

§ 3. Nut Pines, *with leaves, &c. as in the preceding section, but short thick cones of fewer and thick pointless scales, and large hard-shelled edible seeds destitute of a wing.*

P. Cémbra, Cembra or Swiss Stone P. of the higher Alps: small, slow-growing, very hardy ornamental tree, with green 4-sided leaves 3′–4′ long and much crowded on the erect branches; cones round-oval, erect, 2′ long, the round seeds as large as peas.

2. ÀBIES, SPRUCE, FIR (Classical Latin name.—The names Abies and Pícea, for Spruce and Fir, are just oppositely used by different authors. Linnæus employed the former for Spruce, the latter for Fir, and so do some late writers. The ancients used the names just the other way, and the later botanists mostly follow them.) Fl. late spring.

§ 1. Spruce. *Cones hanging or nodding on the end of a branch, their scales persistent: cells of the anther opening lengthwise: the needle-shaped and 4-sided leaves pointing every way.*

A. excélsa, Norway Spruce: the most common and most vigorous species planted, from Europe; fine large tree, with stout branches, deep green leaves larger than in the next, the mature hanging cones 5′–7′ long.

A. nìgra, Black or Double Spruce. Cold woods and swamps N. and along the mountains S.: middle-sized tree, with leaves (seldom over ½′ long) dark green, and a glaucous-whitish variety E.; its ovate cones recurving on short branches, 1′–1½′ long, persistent for several years, thin rigid scales with thin often eroded edge.

A. álba, White Spruce. Wild only along our northern borders and N.; when planted a very handsome tree, with pale glaucous leaves; cylindrical nodding cones about 2′ long, falling the first winter, the thinner scales with a firm even edge.

A. Menzièsii, MENZIES' SPRUCE, of the Rocky Mountains and W., is planted and likely to become common: fine tree, with broader and stiffer leaves than the foregoing, almost prickly-pointed, silvery-whitish beneath; cones about 3′ long, cylindrical, soft; their scales rhombic-ovate, thin and pale.

§ 2. HEMLOCK-SPRUCE (TSUGA). *Cones hanging on declined branches of the preceding year, small, persistent, and their scales persistent: sterile catkins very small and globular, of a few anthers which open across: leaves flat, on distinct little petioles, most of them spreading right and left so as to appear 2-ranked on the branch.*

A. Canadénsis, HEMLOCK-SPRUCE. Common on hills N., and planted for ornament: large tree, with coarse wood, light and spreading spray, broadish-linear and blunt leaves only ½′ long, green above and white beneath, and oval cones only ½′ or ⅔′ long, their bracts very short and hidden.

A. Douglásii, DOUGLAS SPRUCE, one of the tall trees from Rocky Mountains and W. to the Pacific, planted but proves not quite hardy enough N., is of this section: it has slender leaves 1′ or more long, light green, indistinctly 2-ranked; cones 2′–3′ long, loose, with pointed and toothed bracts projecting beyond the scales.

§ 3. FIR. *Cones set rigidly erect on the upper side of spreading branches of the preceding year, their scales and commonly conspicuous bracts falling away with the seeds when ripe from the persistent slender axis: seeds resinous: anthers irregularly bursting: leaves flat, white beneath each side of the prominent midrib, those on horizontal branches inclined to spread right and left so as to appear 2-ranked.*

* BALSAM FIRS, *native trees: bark yielding Canada balsam from blisters, &c.*

A. balsàmea, COMMON B. Small tree of cold or wet grounds N., handsome when young, but short-lived, with worthless wood, narrow linear leaves ⅔′ or less than 1′ long and much crowded, cylindrical violet-colored cones 2′–4′ long and 1′ thick, their bracts with only the abrupt slender point projecting.

A. Fràseri, FRASER'S or SOUTHERN B. Along the higher Alleghanies: small tree, like the preceding; but the small cones (only 1′–2′ long) oblong-ovate, with the short-pointed upper part of the bracts conspicuously projecting and reflexed.

* * SILVER-FIRS, &c., *very choice ornamental trees, only the first at all common.*

← *Leaves blunt.*

A. pectinàta, EUROPEAN SILVER-F. Large tree with wood, its horizontal branches with narrow leaves (greener above than in Balsam F., nearly as white beneath and 1¼′ long) forming a flat spray; cones 6′–8′ long, with slender projecting points to the bracts.

A. Nordmanniàna, from the Crimea and N. Asia; with thicker-set and broader leaves than the foregoing, linear, curved, 1′ long, deep green above and whitened beneath; cones large and ovate.

A. Pichta, SIBERIAN SILVER-F.; with thicker-set leaves than those of European Silver-Fir, dark green above and less white beneath; cones only 3′ long, their short bracts concealed under the scales.

A. grándis, GREAT SILVER-FIR of Oregon and California: resembles a fine Balsam Fir on a large scale, with broader leaves notched at the end, about 1′ long, and thicker cones with concealed bracts.

← *Leaves acute or pointed, especially on main shoots, rigid, widely and about equally spreading on all sides.*

A. Cephalónica, CEPHALONIAN SILVER-FIR: remarkable for its very stiff almost prickly-pointed squarrose leaves dark green above, white beneath.

A. Pinsàpo, SPANISH SILVER-FIR: resembles the last, but not so hardy, leaves less pointed, and the bracts of the cones are concealed.

3. LÀRIX, LARCH. (The ancient name.) Trees planted for ornament and valuable for timber: branches slender, the young ones pendulous · flowers in earliest spring, much before the leaves appear: catkins from later

spurs or broad buds; the sterile globular, yellow; the fertile oval, crimson-red, being the color of the bracts.

L. Europæa, EUROPEAN LARCH, the one generally planted: a fine fast-growing tree, with leaves about 1′ long, and longer cones of numerous scales.

L. Americàna, AMERICAN L., TAMARACK or HACKMATACK. Swamps N.: slender tree with shorter and paler leaves, and small cones of few scales, only ½′ or ⅝′ long.

4. CÈDRUS, CEDAR, i. e. of Lebanon. (Ancient Greek name.) Wood reddish, fragrant. Cult. for ornament, but precarious in this climate.

C. Líbani, CEDAR OF LEBANON; with dark foliage and stiff horizontal branches, the terminal shoot erect: not hardy E. of New York.

C. Deodàra, DEODAR C. of Himalayas; with lighter drooping spray on young trees, and whitish foliage: seems unlikely to flourish in this country.

5. CRYPTOMÈRIA. (Name, from the Greek, means *concealed parts* or *joints.*) Evergreen tree from Japan.

C. Japónica, not hardy N. but often in conservatories; leaves crowded, awl-shaped, many-ranked, edgewise and decurrent on the stem.

6. TAXÒDIUM, BALD-CYPRESS. (Name, from the Greek, means *Yew-like:* the resemblance is only in the shape of the leaves.) Fl. before the leaves, in earliest spring.

T dístichum, AMERICAN B. or SOUTHERN CYPRESS. Large tree in swamps S., and planted, even N.: branchlets slender, many of them falling in autumn like leafstalks; leaves light green, ½′ long, narrow-linear, 2-ranked, on some flower-bearing shoots awl-shaped and imbricated; cones 1′ or less thick.

7. SEQUÒIA, REDWOOD. (Named for the Cherokee half-breed Indian *See-qua-yah,* who invented an alphabet for his nation.) Very celebrated, gigantic, Californian trees, with fibrous bark, not unlike that of Taxodium, and soft, fissile, dull-red wood. Neither species is hardy in New England, or safe in the Middle States; but the second is disposed to stand.

S. sempérvirens, Common Redwood of the coast ranges of California; with flat and linear acute leaves 2-ranked on the branches, but small awl-shaped and scattered ones on the erect or leading shoots, and small globular cones (barely 1′ long).

S. gigantèa, GIANT REDWOOD (in England called WELLINGTONIA) of the Sierra Nevada; with all the leaves awl-shaped and distributed round the branch; cones ovoid, 1½′–2′ long.

8. CUPRÉSSUS, CYPRESS. Classical name of the Oriental Cypress, namely,

C. sempérvirens, planted only far S.; stiff narrow tree, with slender erect branchlets, dark foliage, and cone 1′ in diameter, each scale many-seeded.

C. thujoìdes, WHITE CEDAR. Tree of low grounds S. & E., with white valuable wood, slender spray, and pale glaucous-green triangular-awl-shaped leaves much finer than in Arbor Vitæ; cones hardly ½′ wide, with few seeds to each scale, and these almost wingless.

C. Lawsoniàna, of N. California, recently much planted, and if fully hardy promising to be very ornamental; has thickly set and plume-like flat spray, of bluish-green hue, and cones scarcely above ¼′ in thickness, their scales bearing 2–4 ovules and ripening 2 or 3 seeds.

C. pisífera, or RETINÓSPORA PISIFERA (of which C. OBTÙSA is seemingly a form with the scale-shaped leaves blunter and cone larger), is a scarcely hardy species, introduced from Japan, the cones only as large as peas (to which the specific name refers), a single pair of broad-winged seeds to each scale.

C. squarròsa, or ERICOÌDES, from Japan, is perfectly hardy N., perhaps a variety of the last, but of strikingly different appearance, bearing only loose and awl-shaped leaves.

9. THÙJA, ARBOR VITÆ. (Ancient name of some resin-bearing evergreen.) The varieties planted in collections are very numerous; the following are the principal natural types, by many taken for genera.

T. occidentàlis, AMERICAN ARBOR VITÆ, or WHITE CEDAR of the North. Common tree N., in swamps and cool moist woods, much planted, especially for hedges and screens; leaves mostly of the scale-shaped sort, blunt and adnate; cones oblong, rather soft, the oblong scales pointless, and bearing 2 thin winged seeds. Many nursery varieties, some of which, especially var. ERICOÌDES or HEATH-LIKE A., have the loose awl-shaped sort of leaves.

T. orientàlis, or BIÒTA ORIENTALIS, the CHINESE A., not fully hardy far N.: small tree, with even the scale-shaped leaves acute, cone larger, with thicker scales tipped with a recurving horn-like apex or appendage, each 2-seeded, and the seeds hard-shelled and wingless. — Var. AÙREA, the GOLDEN A. is dwarf and very dense, with yellow-green or partly golden-tinged foliage. Var. TARTÁRICA, is a more hardy glossy-green variety, the leaves scale-shaped. Var. MELDÉNSIS, one with only loose and awl-shaped leaves. Even the slender-stemmed and weeping T. PÉNDULA is an extreme variety.

T. dolabràta, or THUJÓPSIS DOLABRATA of Japan. Remarkable for its very flat spray, broad and very blunt large leaves (sometimes ¼′ long) green above and white beneath; the cone with thick and rounded scales, each with 5 wing-margined seeds.

10. JUNÍPERUS, JUNIPER. (Classical Latin name.) Fl. late spring.

§ 1. *Leaves (scale-like and awl-shaped, small, the former sort minute and very adnate) like those of Cypress and Arbor Vitæ.*

J. Virginiàna, RED CEDAR or SAVIN. A familiar shrub and small or large tree, with most durable and valuable reddish odorous wood; the small fruit dark with a white bloom, erect on the short supporting branchlet.

J. Sabìna, var. **procúmbens.** Rocky banks, trailing over the ground along our northern borders, with the scale-shaped leaves less acute, and the fruit nodding on the short peduncle-like recurved branchlet.

§ 2. *Leaves all of one sort, in whorls of 3, jointed with the stem, linear with an awl-shaped prickly point, the midrib prominent, also the rib-like margins.*

J. commùnis, COMMON JUNIPER. Erect or spreading shrub; with very sharp-pointed leaves green below and white on the upper face; berries large and smooth. The wild, low, much spreading variety is common N. in sterile or rocky ground. Var. HIBÉRNICA, very erect tree-like shrub, forming a narrow column, is most planted for ornament, from Eu.

11. TÁXUS, YEW. (Classical name, from the Greek for a *bow*, the tough wood was chosen for bows.) Fl. early spring

T. baccàta, EUROPEAN YEW. Low tree, with thick upright trunk, spreading short branches, and pointed dark green leaves about 1′ long; when planted in this country forms only a shrub.

Var. **fastigiàta,** IRISH YEW; a singular form, making a narrow column, the branches appressed; the leaves shorter, broader, and scarcely in two ranks.

Var. **Canadénsis,** AMERICAN YEW or GROUND HEMLOCK; shady cold banks and woods N.; the stems spreading over the ground.

12. TORRÈYA. (Named for our *Dr. John Torrey.*) Flowers in spring.

T. taxifólia. Woods in Florida: a handsome tree, but with the wood and foliage ill-scented; leaves like those of Yew but longer and tapering to a sharp point: hardy as a shrub as far north as New York. — T. CALIFÓRNICA, is the CALIFORNIAN NUTMEG-TREE. T. NUCÍFERA, from Japan, is another species.

13. SALISBÙRIA, GINKGO-TREE. (Named for *R. A. Salisbury.*)

S. adiantifòlia (the name denotes the likeness of the leaves to those of the Maidenhair Fern), a most singular tree, planted from Japan, hardy even N.; branches spreading; the fan-shaped alternate leaves with their slender stalks, 3′ or 4 long.

CLASS II. MONOCOTYLEDONOUS or ENDOGENOUS PLANTS: Distinguished by having the woody matter of the stem in distinct bundles scattered without obvious order throughout its whole breadth, never so arranged as all to come in a circle, when abundant enough to form proper wood as in Palms and the like, this is hardest and the bundles most crowded toward the circumference. Embryo with a single cotyledon; the first leaves in germination alternate. Leaves mostly, but not always, parallel-veined. Parts of the flower almost always in threes, never in fives. See Lessons, p. 138, and for style of vegetation, p. 26, fig. 71.

The plants of this class may be arranged under three generally well-marked divisions.

I. SPADICEOUS DIVISION. Flowers either naked, i. e. destitute of calyx and corolla, or these if present, not brightly colored, collected in the sort of spike called a spadix, which is embraced or subtended by the kind of developing bract termed a spathe. The most familiar examples of this division are offered by the Arum Family. To it also belong on one hand the Palms, on the other the Pondweeds — here merely mentioned, as follows: —

Sàbal Palmétto, CABBAGE PALMETTO, of the sandy coast from N. Carolina S., our only tree of the class, with

S. serrulàta, SAW PALMETTO, of the Southern coast, the trunk of which creeps on the ground, and the short petioles are spiny-margined, whence the popular name,

S. Adansònii, DWARF PALMETTO, the leaves of which, rising from a stem underground, are smooth-edged, and

Chamærops Hýstrix, BLUE PALMETTO of S. Carolina, &c., with erect or creeping trunks only 2° – 3° long, and pale or glaucous leaves 3° – 4° high; — these represent with us the PALM FAMILY.

Potamogèton nàtans, and other species of PONDWEED abound in ponds and streams, and represent the NAIADACEÆ or PONDWEED FAMILY, — plants of various forms but of little interest — in fresh water.

Zostèra marìna, GRASS-WRACK or EEL-GRASS of salt water, with its long ribbon-like bright green leaves, and flowers hidden in their upper sheaths, represents the same family in shallow bays of the ocean.

Lémna polyrhìza, DUCKWEED, consisting of little green grains, about $\frac{1}{5}' - \frac{1}{3}'$ long, floating on stagnant water, producing a tuft of hanging roots from their lower face, never here found in blossom,

L. minor, still smaller and with only a single root, — and the less common

L. trisùlca, which is oblong-lanceolate from a stalk-like base, — all propagating freely by budding from the side and separating, — are greatly simplified little plants representing the LEMNACEÆ or DUCKWEED FAMILY, their minute flower rarely seen. See Manual; also Structural Botany, p. 70, fig. 102.

112. ARACEÆ, ARUM FAMILY.

Plants with pungent or acrid watery juice, leaves mostly with veins reticulated so as to resemble those of the first class, flowers in the fleshy head or spike called a spadix, usually furnished with the colored or peculiar enveloping bract called a spathe.

There are several stove-plants of the family now rather common in choice collections, mostly species and varieties of CALADIUM, cultivated for their colored and variegated foliage.

§ 1. *Leaves with expanded blade, and with spreading nerves or veins, never linear.*

* *Flowers wholly destitute of calyx and corolla.*

1. ARISÆMA. Leaves compound, only one or two, with stalks sheathing the simple stem, which rises from a fleshy corm, and terminates in a long spadix bearing flowers only at its base, where it is enveloped by the convolute lower part of the greenish or purplish spathe. Sterile flowers above the fertile, each of a few sessile anthers; the fertile each a 1-celled 5–6-ovuled ovary, in fruit becoming a scarlet berry: commonly dicœcious, the stamens being abortive in one plant, the pistils abortive in the other.
2. COLOCASIA. Leaves simple, peltate, and with a notch at the base. Spathe convolute, yellowish, much longer than the spadix: the latter covered with ovaries at base, above with some abortive rudiments, still higher crowded with numerous 6–8-celled sessile anthers, and the pointed summit naked.
3. PELTANDRA. Leaves arrow-shaped; these and the scape from a tufted fibrous root. Spathe convolute to the pointed apex, green, wavy-margined. Spadix long and tapering, covered completely with flowers, i. e. above with naked shield-shaped anthers each of 5 or 6 cells, opening by a hole at the top, below with one-celled ovaries bearing several erect ovules, in fruit a 1–3-seeded fleshy bag. Seeds obovate, surrounded by a tenacious jelly.
4. RICHARDIA. Leaves arrow-shaped; these and the long scape from a short tuberous rootstock. Spathe broad, spreading above, bright white, convolute at base around the slender cylindrical spadix, which is densely covered above with yellow anthers, below with ovaries, each incompletely 3-celled, and containing several hanging ovules.
5. CALLA. Leaves heart-shaped, on long petioles; these and the peduncles from a creeping rootstock. Spathe open, the upper face bright white, spreading widely at the base of the oblong spadix, which is wholly covered with flowers; the lower ones perfect, having 6 stamens around a 1-celled ovary; the upper often of stamens only. Berries red, containing a few oblong seeds, surrounded with jelly.

* * *Flowers with a perianth, perfect, covering the whole spadix.*

6. SYMPLOCARPUS. Leaves ovate, very large and veiny, short-petioled, appearing much later than the flowers from a fibrous-rooted corm or short rootstock. Spathe shell-shaped, ovate, incurved, thick, barely raised out of ground, enclosing the globular spadix, in which the flowers are as it were nearly immersed. Each flower has 4 hooded sepals, 4 stamens with 2-celled anthers turned outwards, and a 1-celled 1-ovuled ovary tipped with a short awl-shaped style: the fruit is the enlarged spongy spadix under the rough surface of which are imbedded large fleshy seeds.

§ 2. *Leaves linear, flag-like, nerved: spadix appearing lateral.*

7. ACORUS. Spadix cylindrical, naked, emerging from the side of a 2-edged simple scape resembling the leaves, densely covered with perfect flowers. Sepals 6, concave. Stamens 6, with linear filaments and kidney-shaped anthers. Ovary 2–3-celled, with several hanging ovules in each cell, becoming dry in fruit, ripening only one or two small seeds.

1. ARISÆMA, INDIAN TURNIP, &c. (Name altered from *Arum*, to which these plants were formerly referred.) Wild plants of rich woods, fl. in spring, veiny-leaved, their turnip-shaped corm farinaceous, but imbued with an intensely pungent juice, which is dissipated in drying. 2

A. triphýllum, COMMON INDIAN TURNIP. In rich woods; leaves mostly 2, each of 3 oblong pointed leaflets; stalks and spathe either green or variegated with whitish and dark-purple stripes or spots, the latter with broad or flat summit incurved over the top of the club-shaped and blunt spadix.

A. Dracóntium, DRAGON-ARUM, DRAGON-ROOT, or GREEN DRAGON. Low grounds; leaf mostly solitary, its petiole 1°–2° long, bearing 7–11 pedate lance-oblong pointed leaflets; the greenish spathe wholly rolled into a tube with a short slender point, very much shorter than the long and tapering tail-like spathe.

2. COLOCÀSIA. (The ancient Greek name of the common species.) 2/

C. antiquòrum, one variety called C. ESCULÉNTA; cult. in the hot parts of the world for its farinaceous thick rootstocks (which are esculent when the acrid principle is driven off by heat, as also the leaves), and in gardens for its magnificent foliage, the pale ovate-arrow-shaped leaves being 2°–3° long when well grown; the stalk attached much below the middle, the notch not deep.

3. PELTÁNDRA, ARROW-ARUM. (Name of Greek words meaning *shield-shaped stamen,* from the form of the anthers.) Fl. summer. 2/

P. Virgínica. Shallow water: 1°–2° high; leaves pale; the fine transverse nerves running from the midrib and netted with 2 or 3 longitudinal ones near the margin; scapes recurved in fruit; top of the spathe and spadix rotting off, leaving the short fleshy base firmly embracing the globular cluster of green berries.

4. RICHÁRDIA. (Named for the French botanist, *L. C. Richard.*) 2/

R. Africàna, the ÆTHIOPIAN or EGYPTIAN CALLA, of common house-culture, but a native of the Cape of Good Hope and not a true Calla,—too familiar to need fuller description.

5. CÁLLA, WATER ARUM. (An ancient name.) Fl. early summer. 2/

C. palústris. Cold and wet bogs from Penn N.: a low and small, rather handsome plant; leaves 3′–4′ long; filaments slender; anthers 2-celled.

6. SYMPLOCÁRPUS, SKUNK CABBAGE. (Name of Greek words for *fruit grown together.*) 2/

S. fœtidus, the only species, in swamps and wet woods, mostly N.: sending up, in earliest spring, its purple-tinged or striped spathe enclosing the head of flowers, and later the large leaves, when full grown 1°–2° long, in a cabbage-like tuft; the fruit 2′–3′ in diameter, the hard bullet-like seeds almost ½′ wide, ripe in autumn.

7. ÁCORUS, SWEET FLAG or CALAMUS. (Ancient name, from the Greek, said to refer to the use as a remedy for sore eyes.) 2/

1. A. Cálamus, COMMON SWEET-FLAG: in wet grounds; sending up the 2-edged sword-shaped leaves, 2° or more high, from the horizontal pungent aromatic rootstock: fl. early summer.

113. TYPHACEÆ, CAT-TAIL FAMILY.

Marsh herbs, or some truly aquatic, with linear and straight-nerved erect (unless floating) long leaves, sheathing at base, and monœcious flowers on a dry spadix, destitute of calyx and corolla; the fruit dry and nut-like, 1-seeded, rarely 2-seeded.

Near to this belongs PANDÀNUS, cult. for its foliage in some conservatories, with prickly toothed leaves crowded on woody stems.

1. TYPHA. Flowers indefinite, in a dense cylindrical spike terminating the long and simple reed-like stem; the upper part of stamens only, mixed with long hairs; the lower and thicker part of slender-stalked ovaries tapering into a style and below surrounded by numerous club-shaped bristles, which form the copious down of the fruit.
2. SPARGÀNIUM. Flowers collected in separate dense heads, scattered along the summit of the leafy stem; the upper ones of stamens only with some

minute scales interposed, the lower of pistils, each ovary with a few small scales at its base, the whole ripening into a spherical head of small nuts, which are wedge-shaped below and with a pointed tip.

1. **TÝPHA,** CAT-TAIL FLAG. (From Greek word for *fen,* in which these plants abound.) Fl. early summer. 2

T. latifòlia, COMMON C. or REED-MACE; with flat leaves, these and the stem 6°–10° high; no interval between the sterile and fertile part of the spike.

T. angustifòlia, NARROW-LEAVED C. Less common, smaller; leaves narrower, more channelled toward the base; commonly a space between the sterile and the fertile part of the spike.

2. **SPARGANIUM,** BUR-REED. (Name from Greek for a fillet, alluding to the ribbon-shaped leaves.) Fl. summer. 4

S. eurycárpum, GREAT B. Border of ponds and streams, 3°–5° high, with panicled-spiked heads, the fertile when in fruit 1½″ thick, the nuts broad-tipped; stigmas 2; leaves ½′–¾′ wide, flat on upper side, keeled and concave-sided on the other.

S. símplex, SMALLER B. Only N.: in water; erect, sometimes floating, 1°–2° high, mostly with a simple row of heads; leaves narrower; stigma simple, linear, as long as the style; nuts tapering to both ends and with a stalked base.

S. mínimum, SMALLEST B. Mostly with leaves floating in shallow water (6′–10′ long) and flat; heads few; stigma simple, oval; nuts oval, short-pointed and short-stalked.

II. PETALOIDEOUS DIVISION. Flowers not on a spadix, with a perianth (calyx and corolla), all or part of it usually colored.

114. ALISMACEÆ, WATER-PLANTAIN FAMILY.

Marsh herbs, with flowers on scapes or scape-like stems, in panicles, racemes, or spikes, with distinct calyx and corolla, viz. 3 sepals and 3 petals, and from 3 to many distinct pistils; stamens on the receptacle. Juice sometimes milky. The genuine Alismaceæ have solitary ovules and seeds, and wholly separate pistils. Some outlying related plants differing in these respects are annexed.

I. ARROW-GRASS FAMILY. Calyx and corolla colored alike (greenish). Anthers turned outwards. Ovaries 3 partly united, or a single 3–6-celled compound pistil. Leaves petiole-like, without a blade.

1. TRIGLOCHIN. Flowers perfect, small, in a slender spike or raceme, bractless. Calyx and corolla deciduous. Stamens 3 or 6, with oval anthers on short filaments. Ovary 3–6-celled, splitting when ripe from the central axis into as many closed and dry seed-like 1-seeded cells: stigmas sessile.
2. SCHEUCHZERIA. Flowers perfect, few and rather small, in a loose bracted raceme. Sepals and petals oblong, persistent. Stamens 6, with linear anthers. Pistils 3, with globular 2–3-ovuled ovaries slightly united at base, and diverging in fruit, forming 3 turgid pods. Stigmas flat, sessile.

II. WATER-PLANTAIN FAMILY PROPER. Calyx of 3 persistent green sepals. Corolla of 3 deciduous white petals. Anthers turned outwards. Ovaries many, tipped with short style or stigma, 1-ovuled, becoming akenes in fruit. Leaves sometimes only petioles, commonly with distinct blade, when the nerves or ribs are apt to be more or less joined by cross veins or netted.

3. ALISMA. Flowers perfect, loosely panicled. Petals involute in the bud. Stamens 6. Ovaries many, in a ring, very flat-sided, becoming coriaceous flat akenes, 2–3-keeled on the back.
4. ECHINODORUS. Flowers perfect, in proliferous umbels. Petals imbricated in the bud. Stamens 9 or more. Ovaries heaped in a head, becoming wingless akenes.
5. SAGITTARIA. Flowers monœcious, rarely diœcious or polygamous, in successive whorls, the sterile at the summit of the scape; the lowest fertile. Stamens usually numerous. Ovaries very many, heaped on the globular receptacle, in fruit becoming flat and winged akenes.

III. FLOWERING-RUSH FAMILY. (Butomeæ.) Differs from the preceding mainly in the few ovaries having numerous ovules distributed all over the inside.

6. LIMNOCHARIS. Flowers perfect, long-peduncled. Petals large, yellow. Stamens numerous with slender filaments, a few of the outermost without anthers, the rest with linear anthers. Ovaries 6 or more, somewhat united at base. Leaves roundish and heart-shaped, long-petioled.

1. TRIGLÒCHIN, ARROW-GRASS. (Name in Greek means *three-pointed.*) Insignificant rush-like plants, in marshes, mostly where the water is brackish: fl. summer. 2/

T. palústre. Slender, 6′–18′ high, with linear-club-shaped ovary and fruit, the 3 pieces when ripe separating from the sharp-pointed base upwards.

T. marítimum. Stouter, 12′–20′ high, with fruit of about 6 pieces rounded at base. — Var. elàtum, in bogs of the interior, N., 20′–30′ high, the pieces of the fruit sharp-angled on the back.

T. triándrum, a small slender species along the coast S., has only 3 sepals, no petals, 3 stamens, and a 3-lobed fruit.

2. SCHEUCHZÈRIA. (Named for the early Swiss botanist, *Scheuchzer.*)

S. palústris. Peat-bogs from Penn. N.: 1° high: fl. early summer. 2/

3. ALÍSMA, WATER-PLANTAIN. (The old Greek name, of uncertain meaning.) Fl. all late summer.

A. Plantàgo. Shallow water: leaves long-petioled, varying from or oblong-heart-shaped to lanceolate, 3–5-ribbed; panicle 1°–2° long of very many and loose small flowers. 2/

4. ECHINÓDORUS. (Named probably from Greek words for *prickly flask,* the head of fruit being as it were prickly-pointed by the styles, but hardly so in our species. The following occur in muddy or wet places, chiefly W. & S.: fl. summer; the flowering shoots or scapes mostly proliferous and creeping.

E. párvulus: a tiny plant, 1′–3′ high, with lanceolate or spatulate leaves, few-flowered umbels, 9 stamens, and almost pointless akenes. ①

E. rostràtus, with broadly heart-shaped leaves (1′–3′ long, not including the petiole) shorter than the erect scape, which bears a panicle of proliferous umbels; flower almost ½′ wide; 12 stamens; akenes beaked with slender styles. ①

E. radìcans, with broadly heart-shaped and larger leaves (3′–8′ wide) which are very open or almost truncate at base; the creeping scapes or stems becoming 1°–4° long and bearing many whorls; flowers ½′–¾′ broad; akenes short-beaked.

5. SAGITTÀRIA, ARROW-HEAD. (From the Latin for *arrow,* from the sagittate leaves which prevail in the genus. In shallow water: fl. all summer. 2/

* *Filaments long and slender, i. e. as long as the linear-oblong anthers.*

S. lancifòlia. Common from Virginia S.: with the stout leaves 1°–3° and scapes 2°–5° high, the coriaceous blade of the former lance-oblong and

always tapering into the thick petiole, the nerves nearly all from the thick and prominent midrib.

S. variábilis. The common species everywhere, exceedingly variable; almost all the well-developed leaves arrow-shaped; filaments nearly twice the length of the anthers, smooth; akenes broadly obovate, with a long and curved beak; calyx remaining open.

S. calycina. Along rivers, often much immersed; many of the leaves linear or with no blades; the others mostly halberd-shaped; scapes weak, 3′–9′ high; pedicels with fruit recurved; filaments roughish, only as long as the anthers; akenes obovate, tipped with short horizontal style; calyx appressed to head of fruit and partly covering it; the fertile flowers show 9–12 stamens, the sterile occasionally some rudiments of pistils.

* * *Filaments very short and broad.*

S. heterophýlla. Common S. & W.: scapes 3′–2° high, weak; the fertile flowers almost sessile, the sterile long-pedicelled; filaments glandular-pubescent; akenes narrow-obovate, with a long erect beak; leaves linear, lanceolate, or lance-oblong, arrow-shaped with narrow lobes or entire.

S. graminea. Common S.: known from the foregoing by the slender pedicels of both kinds of flowers, small almost beakless akenes, and leaves rarely arrow-shaped.

S. pusílla. From N. Jersey S. near the coast: known by the small size (1–3′ high), few flowers, usually only one of them fertile and recurved in fruit; stamens only about 7, with glabrous filaments; akenes obovate, with erect beak; and leaves without a true blade.

S. nàtans, only S. is probably a large state of the last, with leaves having a floating blade 1′–2′ long, ovate or oblong, or slightly heart-shaped, 5–7 nerved.

6. LIMNÓCHARIS. (Name from the Greek means *delight of the pools.*)

L. Humbòldtii. Tender aquatic plant from S. America, which, turned into pools, spreads widely by its proliferous branching and rooting stems, and flowers all summer and autumn; each flower lasting but a day, the 3 broad sulphur-yellow petals 1′–1½′ long; pistils about 6; leaves about 3′ long, the midrib swollen below.

115. HYDROCHARIDACEÆ, FROG'S-BIT FAMILY.

Water-plants, with diœcious, monœcious, or polygamous flowers on scape-like peduncles from a sort of spathe of one or two leaves, the perianth in the fertile flowers of 6 parts united below into a tube which is coherent with the surface of a compound ovary: — we have three plants, two of them very common.

* *Floating, spreading by proliferous shoots; leaves long-petioled, rounded heart-shaped.*

1. LIMNOBIUM. Flowers monœcious or diœcious, from sessile or short-stalked leaf-like spathes, the sterile spathe of one leaf surrounding 3 long-pedicelled staminate flowers; the fertile 2-leaved, with one short-pedicelled flower. Perianth of 3 outer oval lobes (calyx) and 3 narrow inner ones (petals). A cluster of 6–12 unequal monadelphous stamens in the sterile flower: some awl-shaped rudiments of stamens and a 6–9-celled ovary in the fertile flower; stigmas 6–9, each 2-parted. Fruit berry-like, many-seeded.

* * *Growing under water, the fertile flowers only rising to the surface; the sterile (not often detected) breaking off their short stalks, and floating on the surface around the pistillate flowers.*

1. ANACHARIS. Stems leafy and branching. Fertile flowers rising from a tubular spathe; the perianth prolonged into an exceedingly slender stalk-like tube, 6-lobed at top, commonly bearing 3–9 apparently good stamens: ovary 1-celled with a few ovules on the walls: style coherent with the tube of the perianth: stigmas 3, notched.

3. VALLISNERIA. Stemless; leaves all in tufts from creeping rootstocks. Fertile flowers with a tubular spathe, raised to the surface of the water on an

extremely long and slender scape: tube of the perianth not prolonged beyond the 1-celled ovary, with 3 obovate outer lobes (sepals) and 3 small inner linear ones (petals), and no stamens. Ovules very numerous lining the walls. Stigmas 3, sessile, 2-lobed. Fruit cylindrical, berry-like.

1. LIMNÒBIUM, FROG'S-BIT. (Name in Greek means *living in pools.*) Flowers whitish, the fertile ones larger, in summer. ♃

L. Spóngia. Floating free on still water S. & W.; has been found in bays of Lake Ontario: rooting copiously; leaves 1′–2′ long, purple beneath, tumid at base with spongy air-cells.

2. ANÁCHARIS, WATER-WEED. (Name from the Greek means *destitute of charms.*) Fl. summer. ♃

A. Canadénsis. Slow streams and ponds: a rather homely weed, with long branching stems, beset with pairs or whorls of pellucid and veinless 1-nerved minutely serrulate sessile leaves (½′–1′ long), varying from linear to ovate-oblong, the thread-like tube of the yellowish perianth often several inches long.

3. VALLISNÈRIA, TAPE-GRASS, EEL-GRASS of fresh water. (Named for *A. Vallisneri,* an early Italian botanist.) Fl. late summer. ♃

V. spiràlis. In clear ponds and slow streams, with bright green and grass-like linear leaves (1°–2° long), delicately nerved and netted; fertile scapes rising 2°–4° long, according to the depth of the water, afterwards coiling up spirally and drawing the fruit under water to ripen. — The leaves of this and the preceding are excellent to show *cyclosis.* (See Structural Botany, p. 31, Lessons, p. 150.)

116. PONTEDERIACEÆ, PICKEREL-WEED F.

A few water plants, distinguished from the foregoing by having the tubular corolla-like perianth free from the ovary, and the flowers perfect. Represented by

Schóllera gramínea, or WATER STAR-GRASS; a grass-like weed growing under water in streams, with branching stems beset with linear pellucid sessile leaves; the flower with a slender salver-form pale yellow perianth, of six narrow equal divisions raised to the surface on a very slender tube, and only 3 stamens.

Heteranthèra renifórmis, MUD-PLANTAIN, in mud or shallow water S. & W.; with floating round-kidney-shaped leaves on long petioles, and 3–5 ephemeral white flowers, from the sheathing base or side of a petiole; their perianth salver-form, with a slender tube, bearing 6 nearly equal divisions and 3 dissimilar stamens, one with a greenish, two with yellow anthers.

H. limòsa, in mud S. & W.: distinguished by its oblong or lance-oblong leaves, and solitary blue flower. — The only widely common plant of the family belongs to

1. PONTEDÈRIA, PICKEREL-WEED. (For the Italian botanist *Pontedera.*) Flowers in a terminal spike. Perianth of 6 divisions irregularly united below in a tube, the 3 most united forming an upper lip of 3 lobes, the others more spreading and with more or less separate or lightly cohering claws forming the lower lip, open only for a day, rolling up from the apex downwards as it closes; the 6-ribbed base thickening, turning green, and enclosing the fruit. Stamens 6, the 3 lower in the throat, with incurved filaments; the 3 upper lower down and shorter, often imperfect. Ovary 3-celled, 2 cells empty, one with a hanging ovule. Fruit a 1-celled 1-seeded utricle.

P. cordàta, COMMON P. Everywhere in shallow water; stem 1°–2° high, naked below, above bearing a single petioled heart-shaped and oblong or lance-arrow-shaped obtuse leaf, and a spike of purplish-blue flowers; upper lobe with a conspicuous yellowish-green spot: fl. all summer. ♃

117. ORCHIDACEÆ, ORCHIS FAMILY.

Herbs, with flowers of peculiar structure, the perianth adherent to the one-celled ovary (which has numberless minute ovules on 3 parietal placentæ), its chiefly corolla-like 6 parts irregular, 3 in an outer set answering to sepals, 3 within and alternate with these answering to petals, one of these, generally larger and always different from the others, called the *labellum* or *lip:* the stamens are *gynandrous*, being borne on or connected with the style or stigma, and are only one or two; the pollen is mostly coherent in masses of peculiar appearance. All perennials, and all depend upon insects for fertilization. Beginners will not very easily comprehend the remarkable structure of most Orchideous flowers. But our more conspicuous common species may be readily identified as to genera and species.

§ 1. EPIPHYTE or AIR-PLANT ORCHIDS. *Of these a great variety are cultivated in the choicest conservatories. We have one in the most Southern States.*

1. EPIDENDUM. The 3 sepals and 2 petals nearly alike and widely spreading: the odd petal or lip larger and 3-lobed, its base united with the style, which bears a lid-like anther, containing 4-stalked pollen-masses, over the glutinous stigma.

§ 2. TERRESTRIAL ORCHIDS, *growing in the soil, in woods or low grounds.*

* *Anther only one, but of 2 cells, which when separated (as in Orchis) must not be mistaken for two anthers: pollen collected into one or more masses in each cell: stigma a glutinous surface.*

+– *Lip or odd petal produced underneath into a free honey-bearing horn or spur: pollen of each cell all connected by elastic threads with a central axis or stalk, the lower end of which is a sticky gland or disk, by adhesion to which the whole mass of pollen is dragged from the opening anther and carried off by insects.*

2. ORCHIS. The 3 sepals and 2 petals are conniving and arched on the upper side of the flower; the lip turned downwards (i. e. as the flower stands on its twisted ovary). Anther erect, its two cells parallel and contiguous; the 2 glands side by side just over the concave stigma, and enclosed in a sort of pouch or pocket opening at the top.

3. HABENARIA. Flower generally as in Orchis, but the lateral sepals commonly spreading; the glands attached to the pollen-masses naked and exposed.

+– +– *No spur to the lip: anther borne on the back of the style below its tip. erect or inclined: the ovate stigma on the front. Flowers in a spike, small, white.*

4. SPIRANTHES. Flowers oblique on the ovary, all the parts of the perianth erect or conniving, the lower part of the lip involute around the style and with a callosity on each side of the base, its narrower tip somewhat recurved and crisped. Pollen-masses 2 (one to each cell), each 2-parted into a thin plate (composed of grains lightly united by delicate threads), their summits united to the back of a narrow boat-shaped sticky gland set in the beaked tip over the stigma. Leaves not variegated.

5. GOODYERA. Flowers like Spiranthes; but the lip more sac-shaped, closely sessile, and destitute of the callous protuberances at base. Leaves variegated with white veining.

+– +– +– *No spur to the lip, or one adherent to the ovary: anther inverted on the apex of the style, commonly attached by a sort of hinge: pollen 2 or 4 separate soft masses, not attached to a stalk or gland.*

++ *Flowers rather large: pollen-masses soft, of lightly-connected powdery grains.*

6. ARETHUSA. Flower only one, on a naked scape; the 3 sepals and 2 petals lanceolate and nearly alike, all united at the base, ascending and arching over the top of the long and somewhat wing-margined style, on the petal-like top of which rests the helmet-shaped hinged anther, over a little shelf, the

lower face of which is the stigma. Lip broad, erect, with a recurving rounded apex and a bearded crest down the face. Pollen-masses 4, two in each cell of the anther.

7. CALOPOGON. Flowers 2, 3, or several, in a raceme-like loose spike; the lip turned towards the axis, diverging widely from the slender (above wing-margined) style, narrower at base, larger and rounded at the apex, strongly bearded along the face. Sepals and the 2 petals nearly alike, lance-ovate, separate and spreading. Anther lid-like: pollen-masses 4.
8. POGONIA. Flowers one or few terminating a leaf-bearing stem; the sepals and petals separate; lip crested or 3-lobed. Style club-shaped, wingless: stigma lateral. Anther lid-like, somewhat stalked: pollen-masses 2, only one in each cell.

++ ++ *Flowers mostly small, dull-colored, in a spike or raceme on a brownish or yellowish leafless scape: pollen-masses* 4, *globular, soft-waxy.*

9. CORALLORHIZA. Flowers with sepals and petals nearly alike; the lip broader, 2-ridged on the face below, from its base descends a short sac or obscure spur which adheres to the upper part of the ovary. Scape with sheaths in place of leaves; the root or rootstock thickish, much branched and coral-like.
10. APLECTRUM. Flowers as in No. 9, but no trace of a spur or sac, larger. Scape rising from a large solid bulb or corm, which also produces, at a different season, a broad and many-nerved green leaf.

* * *Anthers* 2 (Lessons p. 111, fig. 226), *borne one on each side of the style, and a trowel-shaped body on the upper side answers to the third stamen, the one that alone is present in other Orchids: pollen powdery or pulpy: stigma roughish, not glutinous.*

11. CYPRIPEDIUM. Sepals in appearance generally only 2, and petals 2, besides the lip which is a large inflated sac, into the mouth of which the style, bearing the stamens and terminated by the broad terminal stigma, is declined. Pollen sticky on the surface, as if with a delicate coat of varnish, powdery or at length pulpy underneath.

1. EPIDÉNDUM. (Name in Greek means *upon a tree,* i. e. an epiphyte.)

E. conópseum, our only wild Orchideous Epiphyte or Air-plant, is found from South Carolina S. & W. on the boughs of Magnolia, &c., clinging to the bark by its matted roots, its tuberous rootstocks bearing thick and firm lance-olate leaves (1′–3′ long), and scapes 2′–6′ long, with a raceme of small greenish and purplish flowers, in summer. (Lessons, p. 36, fig. 88.)

2. ÓRCHIS. (The ancient name, from the Greek.) We have only one true Orchis, viz.

O. spectábilis, Showy Orchis. Rich hilly woods N.; with 2 oblong obovate glossy leaves (3′–5′ long) from the fleshy-fibrous root, and a leafy-bracted scape 4′–7′ high, bearing in a loose spike a few pretty flowers, pink-purple, the ovate lip white: in late spring.

3. HABENÀRIA, popularly called ORCHIS. (Name from Latin *habena,* a rein or thong, from the shape of the lip of the corolla in some species.) Flowers in a terminal spike, each in the axil of a bract, in late spring or summer. In all but one species the ovary twists and the lip occupies the lower or anterior side of the flower.

§ 1. Fringed Orchis. *Lip and often the other petals cut-fringed or cleft, shorter than the long curving spur: cells of the anther more or less diverging and tapering below, the sticky gland at their lower end strongly projecting forwards. These are our handsomest wild Orchises: all grow in bogs or low grounds: stems leafy,* 1°–4° *high.*

* *Flowers violet-purple, in summer: the lip fan-shaped, 3-parted nearly down to the stalk-like base, and the divisions more or less fringed.*

H. fimbriàta, Larger Purple Fringed O. Wet meadows from Penn. N. E.: lower leaves oval or oblong, upper few and small; raceme-like spike oblong, with rather few large flowers in early summer; petals oblong, toothed down the sides; lip almost 1′ wide, hanging, cut into a delicate fringe.

H. psycòdes, Smaller Purple Fringed O. Common, especially N.: leaves oblong, above passing into lance-linear bracts; spike cylindrical, 4′–10′ long, crowded with smaller and fragrant flowers; lateral petals wedge-obovate, almost entire; lip spreading, only ½′ wide, cut into denser fringe.

H. peramœna. From Penn. W. & S. along and near the mountains: flowers of size intermediate between the two preceding, the broad wedge-shaped lobes of the lip moderately cut-toothed, but not fringed.

* * *Flowers greenish or yellowish-white, in late summer: glands oval or lanceolate, almost facing each other: spike long and loose.*

H. leucophæa. From Ohio W. & S.: 2°–4° high; leaves lance-oblong; flowers rather large, the fan-shaped lip 3-parted, ¾ long, and many-cleft to the middle into a thread-like fringe.

H. lácera, Ragged Fringed O. Common N. & E.: 1°–2° high; leaves lanceolate or oblong; petals oblong-linear, entire; divisions of the slender-stalked 3-parted lip narrow and slenderly fringed.

* * * *Flowers bright white, in summer: the lip fringe-margined but not cleft.*

H. blephariglóttis, White Fringed O. Peat-bogs N.: like the next, but rather smaller, 1° high, the fringe of the lance-oblong lip hardly equal to the width of its body.

* * * * *Flowers bright orange-yellow, in late summer: glands orbicular, projecting on the beak-pointed bases of the very diverging anther-cells: ovary and pod long, tapering to the summit.*

H. ciliàris, Yellow Fringed O. Sandy bogs: 1½°–2° high; leaves oblong or lanceolate; spike short, of many crowded very showy flowers; petals cut-fringed at apex, the oblong body of the lip narrower than the copious long and fine fringe.

H. cristàta, from Penn. S.: smaller, with narrower leaves, and flowers only a quarter the size of the preceding, the petals crenate, and the ovate lip with a narrow lacerate fringe.

§ 2. *Yellow, green, or white species, with lip entire, at least not fringed.*

* *Stem leafy: leaves oblong or lanceolate: flowers small: anther-cells nearly parallel.*

H. íntegra. Pine barrens from New Jersey S.: resembles H. cristata, having small bright orange-yellow flowers, but the lip is ovate and entire or barely crenulate.

H. viréscens. Wet grounds, common: 10′–20′ high, with a conspicuously bracted at length long and loose spike of small dull-green flowers; the lip oblong, almost truncate at the apex, its base with a tooth on each side and a nasal protuberance on the face; spur slender, club-shaped.

H. víridis, var. **bracteàta.** Cold damp woods N.: 6′–12′ high, with lower leaves obovate, upper reduced to bracts of the short spike, which are much longer than the green flowers; lip truncate and 2–3-toothed at the tip, very much longer than the sac-shaped spur.

H. hyperbòrea. Cold low woods and bogs N: 6′–2° high, very leafy; leaves lanceolate; spike dense, often long; flowers greenish, the lanceolate lip like the other petals, spreading, entire, about the length of the incurved spur.

H. dilatàta. Resembles the last, grows in same places, but commonly more slender and with linear leaves; flowers white, less wide, open, the lanceolate lip with a rhombic-dilated base; glands strap-shaped.

H. nívea. Sandy bogs, from Delaware S.: 1°–2° high, all the upper leaves bract-like; flowers white, in a loose cylindrical spike, very small, different from all the rest in having the (white) ovary without a twist, and the linear-oblong entire lip with its long thread-like spur therefore looking inwards.

* * *Stem a naked scape: the leaves only 2 at the ground: flowers pretty large in a loose spike: anther-cells widely diverging at their tapering or beak-like projecting base.*

H. orbiculàta, Great Green O. Evergreen woods and hillsides N.: a striking plant; its exactly orbicular leaves 4′–8′ wide, bright green above and silvery beneath, lying flat on the ground; scape 1°–2° high, bracted, bearing many large greenish-white flowers in a loose raceme; sepals roundish; lip nar-

rowly spatulate-linear and drooping; spur about $1\frac{1}{2}'$ long, curved, gradually thickened towards the blunt tip: fl. July.

H. Hoókeri. Sandy woods from Penn. N.: smaller in all parts, flowers in June; the orbicular leaves only $3'-5'$ broad and flat on the ground; scape naked, $6'-12'$ high, bearing fewer yellowish-green flowers in a strict spike; sepals lance-ovate; lip lanceolate and pointed, incurved, the other petals lance-awl-shaped; spur slender, acute, nearly $1'$ long.

4. SPIRÁNTHES, LADIES'-TRESSES. (Name from the Greek, denotes that the flowers are spiral: they often are apparently spirally twisted in the spike.) Flowers white. The species are difficult; the following are the commonest.

* *Flowers crowded in 3 ranks in a close spike: wet banks or bogs.*

S. latifòlia. Only from Delaware N.: known by its oblong or lance-oblong leaves ($1'-3'$ long), all at the base of the scape, and narrow spike of small smooth flowers early in June.

S. Romanzoviàna. Cold bogs, from N. New England W.: $5'-15'$ high, with oblong-lanceolate or grassy-linear leaves, a dense spike of flowers at midsummer, all 3 sepals and 2 petals conniving to form an upper lip.

S. cérnua, Common E. and S.: $6'-20'$ high, with lance-linear leaves, cylindrical often lengthened spike, and lower sepals not upturned but parallel with the lower petal or lip: fl. in autumn.

* * *Flowers in one straight or often spirally twisted rank, in summer.*

S. gramínea. Wet grassy places from N. England S.: stem about 1° high, towards its base and at the fleshy root bearing linear or lance-linear leaves, which mostly last through the flowering season; spike dense and much twisted, rather downy.

S. grácilis. Hills and sandy plains: scape slender, $8'-18'$ high, bearing a slender spike; leaves all from the tuberous root, short, ovate or oblong, apt to wither away before the small flowers appear in late summer.

5. GOODYÈRA, RATTLESNAKE PLANTAIN. (Named for *John Goodyer*, an English botanist.) Flowers small, in summer, greenish-white, spiked on a scape; the leaves all clustered at the root, ovate, small.

G. rèpens. Evergreen woods N.: $3'-8'$ high, slender; flowers in a loose one-sided spike, with inflated sac-shaped lip.

G. pubéscens. Oak and pine woods E. & S.: $6'-12'$ high; larger, with leaves more beautifully white-reticulated, and flowers not one-sided in the denser spike; lip globular.

G. Menzièsii. Woods, only from New York W.: $9'-12'$ high; leaves less reticulated; flowers loose in the spike, narrower and pointed in the bud, the lip hardly sac-shaped at the base and tapering to a narrow apex.

6. ARETHÙSA. (Mythological name of a nymph and fountain.) Fl. late spring.

A. bulbòsa. A charming little plant, in wet bogs N.: consists of a scape $6'-10'$ high rising from a solid bulb or corm, sheathed below with one or two green bracts, and terminated with the bright rose-pink flower $1'-2'$ long.

7. CALOPÒGON. (Name in Greek means *beautiful beard*, referring to the lip.) Fl. early summer.

C. pulchéllus. Wet bogs: scape about 1° high, from a small solid bulb, slender, bearing next the base a long linear or lanceolate many-nerved grass-like leaf, and at the summit 2–6 beautiful pink-purple flowers ($1'$ broad), the lip as if hinged at its base, bearded with white, yellow, and purple club-shaped hairs.

8. POGÒNIA. (Name in Greek means *bearded*, i. e. on the lip: this is hardly the case in most of our species.) We have several, but the only widely common one is

P. ophioglossoides. Wet bogs along with the Calopogon, and in blossom at the same time: stem $6'-9'$ high from a root of thick fibres, bearing

an oval or lance-oblong closely sessile leaf near the middle, and a smaller one or bract near the terminal flower, sometimes a second flower in its axil; flower 1′ long, pale rose-color or whitish, sweet-scented; sepals and petals nearly alike; lip erect, beard-crested and fringed.

9. CORALLORHÌZA, CORAL-ROOT (which the name means in Greek).

C. innàta. Low woods, mostly N.: 3′–6′ high, yellowish, with 5–10 very small almost sessile flowers; lip 3-lobed or halberd-shaped at base: fl. spring.

C. odontorhìza. Rich woods, common only S.: 6′–16′ high, thickened at base, brownish or purplish, with 6–20 pedicelled flowers, and lip not lobed but rather stalked at base, the spur obsolete.

C. multiflòra. Common in dry woods, 9′–20′ high, purplish, stout, with 10–30 short-pedicelled flowers, lip deeply 3-lobed, and adnate spur manifest.

10. APLÉCTRUM, PUTTY-ROOT, ADAM-AND-EVE. (Name, from the Greek, means *destitute of spur.*)

A. hyemàle. Woods, in rich mould, mostly towards the Alleghanies and N.: scape and dingy flowers in early summer; the large oval and plaited-nerved petioled leaf appears towards autumn and lasts over winter; solid bulbs one each year, connected by a slender stalk, those of at least two years found together (whence one of the popular names), 1′ thick, filled with strong glutinous matter, which has been used for cement, whence the other name.

11. CYPRIPÈDIUM, LADY'S SLIPPER, MOCCASON-FLOWER. (Greek name for *Venus,* joined to that for *a slipper* or *buskin.*) Two exotic species are not rare in conservatories; the others are among the most ornamental and curious of our wild flowers: in spring and early summer. Root-stocks very short and knotty, producing long and coarse fibrous roots.

§ 1. *The three sepals separate: stem leafy, one-flowered.*

C. arietìnum, RAM'S HEAD C. Cold bogs N.: not common; the smallest species, with slender stem 6′–10′ high, oblong-lanceolate leaves, and a dingy purplish flower, the sac conical and in some positions resembling a ram's head, one sepal lance-ovate, the two others and the two petals linear.

§ 2. *Two of the sepals united by their edges into one under the sac or slipper, but their very tips sometimes separate.*

* *Stem 1°–2° high, leafy to the 1–3-flowered summit: leaves lance-oblong or ovate, with many somewhat plaited nerves, more or less pubescent: sac or slipper horizontal, much inflated, open by a rather large round orifice.*

+– *Sepals and linear wavy-twisted petals brownish, pointed, larger than the sac.*

C. pubéscens, YELLOW LADY'S-SLIPPER. Low woods and bogs, mainly N.: sac light yellow, higher than broad, convex above; sepals long-lanceolate: flowers early summer, scentless.

C. parviflòrum, SMALLER YELLOW L. In similar situations; stems and leaves generally smaller, and flower about half the size of the other, somewhat fragrant, the sac broader than high, deep yellow, and the lance-ovate sepals browner.

C. cándidum, SMALL WHITE L. Bogs and low prairies, chiefly W.: small, barely 1° high, slightly pubescent; sac like that of preceding but white.

+– +– *Sepals and petals broad or roundish and flat, white, not larger than the sac.*

C. spectábile, SHOWY L., and deserving the name, in bogs and rich low woods N., and along the mountains S.: downy, 2° or more high, with leaves 6′–8′ long, white flowers with the globular lip (1½′ long) painted with pink-purple, in July.

* * *Scape naked, bearing a small bract and one flower at summit.*

+– *Wild species, with only a pair of oblong many-nerved downy leaves at the root.*

C. acàule, STEMLESS L. Moist or sandy ground in the shade of evergreens: scape 8–12′ high; sepals and petals greenish or purplish, the latter

linear, shorter than the rose-purple oblong-obovate drooping sac, which is split down the front but nearly closed: fl. spring.

+– +– *East Indian species of the conservatory, with several thick and firm keeled leaves in 2 ranks at the root: sac hanging, largely open at top.*

C. insígne, has linear strap-shaped cartilaginous leaves, and yellow flower with some greenish and purple-spotted.

C. venústum, with more fleshy oblong-strap-shaped mottled and spotted leaves, and purplish flower with some green and yellow.

118. SCITAMINEÆ, BANANA FAMILY.

Here is assembled a group of tropical or subtropical plants, with leaves having distinct petiole and blade, the latter traversed by nerves running from the midrib to the margin; flowers irregular, with a perianth of at least two ranks of divisions, below all combined into a tube which is adherent to the 3-celled ovary; the stamens 1 – 6 and distinct. We have only two, by no means common, wild representatives on our southeastern borders; the cultivated ones are chiefly grown for their ornamental foliage, and most of them are rarely seen in blossom. They may therefore be simply referred to, as follows.

I. GINGER FAMILY. Seeds, rootstocks, or roots hot-aromatic. Stamen only one, with a 2-celled anther, commonly embracing the style, but not united with it.

Hedýchium Gardneriànam, Garland-Flower, cult. from India: stems 3° – 4° high, furnished to the top with oblong 2-ranked leaves, terminating in a large spike of handsome light-yellow flowers, a slender tube bearing 6 divisions which may be likened to those of an Orchideous flower, one (answering to the lip) much larger and broader than the 5 others, and a very long protruding reddish filament terminated by a yellow anther sheathing the style up almost to the stigma.

II. ARROWROOT or INDIAN-SHOT FAMILY. No hot-aromatic properties, the thick rootstocks, &c., commonly contain much starch, from which genuine arrowroot is produced. Stamen only one with an anther, and that one-celled.

Thàlia dealbàta, wild in marshes and ponds far S., is dusted over with a white powder, the heart-ovate long-petioled leaves all from the root, reed-like scape branching above into panicled spikes of small much-bracted purple flowers.

Maránta zebrìna, rarely flowers, but is a showy leaf-plant in conservatories; the oblong leaves 2 or 3 feet long, purple beneath, the upper surface satiny and with alternating stripes of deep and pale green; flowers dull purple, inconspicuous, in a bracted head or spike near the ground on a short scape.

Cánna Índica, Common Indian Shot (so called from the hard shot-like seeds, these several in the 3 cells of the rough-walled pod): frequently planted for summer flowering; the lance-ovate or oblong pointed leaves 6′ – 12′ long; flowers several in a simple or branching spike, about 2′ long, red, varying to yellow, or variegated; stamen with petal-like filament bearing the anther on one side, otherwise resembling the 3 divisions of an inner corolla, these probably transformed sterile stamens. — The following, more magnificent for summer foliage, and sometimes for flowers, are choicer sorts, but much confused as to species.

C. Warszewíczii, 4° – 5° high, with mostly purplish or purple-margined pointed leaves, and crimson-red flowers.

C. díscolor, grows 6°–10° high, with broad purple-tinged very large leaves, and crimson or red-purple flowers.

C. glàuca, especially its var. ANNÆI, 8°–13° high, with its glaucous pale taper-pointed leaves, and yellow or red flowers 4′ long.

C. fláccida, wild in swamps from South Carolina S.: 2°–4° high, with ovate-lanceolate pointed leaves, and yellow flowers 3′–4′ long; all the inner divisions obovate and wavy, lax, the 3 outer or calyx reflexed.

III. BANANA FAMILY PROPER. Not aromatic or pungent. Stamens 5 with 2-celled anthers, and an abortive naked filament.

Strelítzia Reginæ, a large stemless conservatory plant, from the Cape of Good Hope, winter-flowering, with 2-ranked root-leaves, their long rigid petioles bearing an ovate-oblong thick blade; scape bearing at apex an oblique or horizontal and rigid conduplicate spathe, from which several large and strange-looking blossoms appear in succession; the 3 outer divisions of the perianth 3′–4′ long, orange-yellow, one of them conduplicate and taper-pointed, and somewhat like the two larger of the bright blue inner set, or true petals, which are united and cover the stamens, the other petal inconspicuous.

Mùsa sapiéntum, BANANA; cult. for foliage and for the well-known fruit; the enwrapping bases of the huge leaves forming a sort of tree-like succulent stem, 10°–20° high; the flower-stalk rising through the centre, and developing a drooping spike, the flowers clustered in the axil of its purplish bracts; perianth of 2 concave or convolute divisions or lips, the lower 3–5-lobed at the apex and enclosing the much smaller upper one; berry oblong, by long cultivation (from offshoots) seedless. (Lessons, p. 26, fig. 71.)

M. Cavendíshii. A dwarf variety, flowering at a few feet in height, is the more manageable one, principally cultivated for fruiting.

119. BROMELIACEÆ, PINE-APPLE FAMILY.

Tropical or subtropical plants, the greater part epiphytes, with dry or fleshy, mostly rigid, smooth or scurfy leaves, often prickly edged, and perfect flowers with 6 stamens. — represented by several species of Tillandsia in Florida, a small one further north, and several of various genera in choice conservatories, not here noticed.

Ananássa sativa, PINE-APPLE; cult. for its fruit, the flowers abortive, and sometimes for foliage, especially a striped-leaved variety.

Tillándsia usneoides, the LONG MOSS or BLACK MOSS (so called), hanging from trees in the low country from the Dismal Swamp S.: gray-scurfy, with thread-shaped branching stems, linear-awl-shaped recurved leaves, and small sessile green flowers; the ovary free, forming a narrow 3-valved pod, filled with club-shaped hairy-stalked seeds: fl. summer.

120. AMARYLLIDACEÆ, AMARYLLIS FAMILY.

Chiefly perennial herbs, with leaves and scape from a bulb, corm, &c., the leaves nerved from the base, and rarely with any distinction of blade and petiole; the perianth regular or but moderately irregular and colored, its tube adherent to the surface of the 3-celled ovary; and 6 stamens with good anthers. Bulbs acrid, some of them poisonous. To this family belong many of the choicer bulbs of house-culture, only the commonest here noticed.

§ 1. *Scape and linear hairy leaves from a little solid bulb or corm.*

1. HYPOXYS. Perianth 6-parted nearly to the ovary, spreading, greenish outside, yellow within, persistent and withering on the pod.

§ 2. *Scape and mostly smooth leaves from a coated bulb.*

* *A cup-shaped, funnel-shaped, or saucer-shaped crown on the throat of the perianth.*

2. NARCISSUS. Perianth with a more or less cylindrical tube, 6 equal widely spreading divisions, and stamens of unequal length included in the cup or crown. Scape with one or more flowers, from a scarious 1-leaved spathe.
3. PANCRATIUM. Perianth with a slender tube, 6 long and narrow divisions, and a cup to which the long filaments adhere below, and from the edge of which they project. Anthers linear, fixed by the middle. Scape bearing a few flowers in a cluster, surrounded by some leaf-like or scarious bracts.

* * *No cup nor crown to the flower, or only minute scales sometimes in the throat.*

+– *Filaments borne on the tube of the flower: anthers fixed by the middle, versatile: spathe of* 1 *or* 2 *scales or bracts.*

4. CRINUM. Perianth with a slender long tube and 6 mostly long and narrow spreading or recurved divisions. Stamens long. Scape solid, bearing few or many flowers, in an umbel-like head. Bulb often columnar and rising as if into a sort of stem. Leaves in several ranks.
5. AMARYLLIS. Perianth various; the divisions oblong or lanceolate. Scape bearing one or more flowers. Leaves mostly 2-ranked.

+– +– *Filaments on the ovary at the base of the* 6*-parted perianth: anthers erect, not versatile: spathe a bract opening on one side.*

6. GALANTHUS. Scape with usually a single small flower on a nodding pedicel. Perianth of 6 oblong separate concave pieces; the three inner shorter, less spreading, and notched at the end. Anthers and style pointed.
7. LEUCOIUM. Scape bearing 1–7 flowers on nodding pedicels. Perianth of 6 nearly separate oval divisions, all alike. Anthers blunt. Style thickish upwards.

§ 2. *Stems leafy, or scape beset with bracts, from a tuberous rootstock or crown.*

8. ALSTRŒMERIA. Stems slender and weak or disposed to climb, leafy to the top, the thin lanceolate or linear leaves commonly twisting or turning over. Flowers in a terminal umbel. Perianth 6-parted nearly or quite to the ovary, rather bell-shaped, often irregular as if somewhat 2-lipped. Stamens more or less declined. Style slender: stigma 3-cleft.
9. POLIANTHES. Stem erect and simple from a thick tuber, bearing long-linear channelled leaves, and a spike of white flowers. Perianth with a cylindrical and somewhat funnel-shaped slightly curved tube, and 6 about equal spreading lobes. Stamens included in the tube: anthers erect. The summit of the ovary and pod free from the calyx-tube; in this and other respects it approaches the Lily Family.
10. AGAVE. Leaves thick and fleshy with a hard rind and a commonly spiny margin, tufted on the crown, which produces thick fibrous roots, and suckers and offsets; in flowering sends up a bracted scape, bearing a spike or panicle of yellowish flowers. Perianth tubular-funnel-shaped, persistent, with 6 narrow almost equal divisions. Stamens projecting: anthers linear, versatile. Pod containing numerous flat seeds.

1. HYPÓXYS, STAR-GRASS. (Name from the Greek, means *acute at the base;* the pod is often so.)

H. erècta, the common species, in grass; with few-flowered scape 3′–8′ high, and leaves at length longer; yellow star-like flower over ½′ broad.

2. NARCÍSSUS. (Greek name, that of the young man in the mythology who is said to have been changed into this flower.) Most of them are perfectly hardy: fl. spring.

N. poéticus, Poet's N. Leaves nearly flat; scape 1-flowered; crown of the white flower edged with pink, hardly at all projecting from the yellowish throat: in full double-flowered varieties the crown disappears.

N. biflòrus, Two-flowered N., or Primrose Peerless of the old gardeners, has two white or pale straw-colored flowers, and the crown in the form of a short yellow cup.

N. polyánthos is the parent of the choicer sorts of Polyanthus N.; flowers numerous, white, the cup also white.

N. Tazétta, POLYANTHUS N. Leaves as of the preceding linear and nearly flat, glaucous; flowers numerous in an umbel, yellow or sometimes white, with the crown a golden or orange-colored cup one third or almost one half the length of the divisions.

N. Jonquílla, JONQUIL. Leaves narrow, rush-like or half-cylindrical; flowers 2 to 5, small, yellow, as also the short cup, very fragrant.

N. Pseudo-Narcíssus, DAFFODIL. Leaves flat, and 1-flowered scape short; flower large, yellow, with a short and broad tube, and a large bell-shaped cup, having a wavy-toothed or crisped margin, equalling or longer than the divisions: common double-flowered in country gardens.

3. PANCRÀTIUM. (Name in Greek means *all powerful:* no obvious reason for it.) Flowers large, showy, fragrant, especially at evening in summer. Cult. at the North; the following wild S. in wet places on and near the coast.

P. maritimum. Glaucous; leaves linear, erect; scape barely flattish; perianth 5′ long, its green tube enlarging at summit into the funnel-shaped 12-toothed cup, to the lower part of which the spreading narrow-lanceolate divisions of the perianth are united.

P. rotàtum (or P. MEXICÀNUM). Leaves linear-strap-shaped, widely spreading, bright green, 2′ or more wide; scape sharply 2-edged; slender tube of the perianth and its linear widely spreading divisions each about 3′ long, the latter wholly free from the short and broadly open wavy-edged cup.

4. CRÌNUM. (The Greek name for a Lily.) Showy conservatory plants, chiefly from tropical regions; one wild S.

C. amábile, from East Indies; the huge bulb rising into a column; leaves becoming several feet long and 3′–5′ wide; flowers numerous, 8′–10′ long, crimson-purple outside, paler or white within.

C. Americànum, wild in river swamps far S.; much smaller, with a globular bulb; scape 1°–2° high; flower white, 6′–7′ long.

5. AMARÝLLIS. (Dedicated to the nymph of this name.) One wild species S.; many in choice cultivation, and the species mixed. The following are the commonest types.

A. Atamásco, ATAMASCO LILY, wild from Virginia S. in low grounds; scape 6′–12′ high, mostly shorter than the glossy leaves; flower 2′–3′ long, single from a 2-cleft spathe, regular, funnel-form, white and pinkish; stamens and style declined.

A. formosíssima, JACOBÆAN or ST. JAMES'S LILY, of the section SPREKÈLIA: cult. from South America: scape bearing a single large and declined deep crimson-red flower, with hardly any tube, and 2-lipped as it were, three divisions recurved-spreading upwards, three turned downwards, these at base involute around the lower part of the deflexed stamens and style.

A. Reginæ, from South America; with 2–4 large almost regular nodding flowers, crimson-red, with hardly any tube, and the deflexed stamens curved upwards at the end.

A. Belladónna, from the Cape of Good Hope; has elongated bulbs, channelled narrow leaves shorter than the solid scape, and several almost regular large rose-red fragrant flowers, funnel-form with very short tube, the stamens not much declined.

A. speciòsa, or VALLÒTA PURPÙREA, from Cape of Good Hope; the scarlet-red flowers with funnel-shaped tube rather longer than the broad ovate and nearly equal spreading divisions.

6. GALÁNTHUS, SNOWDROP. (Name formed of the Greek words for *milk* and *flower,* probably from the color.) Fl. earliest spring.

G. nivàlis, of Europe, sends up soon after the winter's snow leaves the ground a pair of linear pale leaves and a scape 3′–6′ high, bearing its delicate drooping white flower, the inner divisions tipped with green: a variety is full double.

7. LEUCÒIUM, SNOWFLAKE. (Ancient Greek name means *White Violet.*) In gardens from Europe; much like Snowdrops on a larger scale, flowering later, the scape more leafy at base, and leaves bright green.

L. vérnum, SPRING S. Scape about 1° high, mostly 1-flowered, in spring; pod pear-shaped and 6-sided.

L. æstìvum, SUMMER S. Scape 2° high, bearing 3–7 rather broader flowers in late spring or early summer; pod rounder.

8. ALSTRŒMÈRIA. (Named by Linnæus for his friend *Baron Alstrœmer.*) Plants of the conservatory, from W. South America, of mixed species.

A. Pelegrìna, LILY OF THE INCAS, from Peru. Flowers few or solitary at the end of the branches, open, rose-colored or whitish, blotched with pink and spotted with purple, with some yellow on the inner divisions.

A. psittacìna. Flowers umbelled, funnel-form in shape, the spatulate divisions more erect and close, red, tipped with green and brown-spotted.

A. versìcolor. Flowers few, terminating the drooping or spreading branches, yellow spotted with purple.

9. POLIÁNTHES, TUBEROSE. (Name from Greek words for *city* and *flower;* therefore not *Polyanthes.* And the popular name relates to the tuberous rootstock, therefore not *Tube-Rose.*)

P. tuberòsa, the only species cultivated, probably originally from Mexico; the tall stem with long several-ranked leaves at base and shorter and sparser ones towards the many-flowered spike (produced in autumn when planted out); the blossoms very fragrant, white, or slightly tinged with rose, the choicer sorts full-double.

10. AGÀVE, AMERICAN ALOE. (Name from Greek word for *wonderful.*) Plants flower only after some years, and die after maturing the fruit.

A. Virgínica, of sterile soil from Virginia to Ill. and S.; has lance-oblong denticulate and spiny-tipped leaves 6′–12′ long, and scape bearing a loose simple spike of small flowers, 3°–6° high.

A. Americàna, of Mexico, is the common CENTURY PLANT or AMERICAN ALOE; with very thick spiny-toothed and spine-pointed leaves, 2°–4° long, pale green, or a variety yellowish-striped, the scape when developed from old plants (said to flower only after 100 years in cool climates) tree-like, bearing an ample panicle.

121. IRIDACEÆ, IRIS FAMILY.

Distinguished by the equitant erect leaves (Lessons, p. 69, fig. 186, 187), of course 2-ranked, and the 3 stamens with anthers facing outwards. Flowers showy, colored, mostly from a spathe of two or more leaves or bracts; the tube of the perianth coherent with the 3-celled ovary and often prolonged beyond it, its divisions 6 in two sets (answering to sepals and petals), each convolute in the bud. Style 1, or rarely 3-cleft: stigmas 3, opposite the 3 stamens and the outer divisions of the perianth. Fruit a 3-celled and many-seeded pod. Stems or herbage rising from a rootstock, tuber, or solid bulb (corm, Lessons, p. 46, fig. 105, 106); these are acrid, sometimes very much so. All are perennial herbs.

§ 1. *Perianth of 3 outer recurving, and 3 inner commonly smaller erect or incurving divisions: stigmas or more properly lobes of the style petal-like.*

1. IRIS. Flowers with tube either slightly or much prolonged beyond the ovary, in the latter case coherent also with the style. Stamens under the overarching branches of the style: anthers linear or oblong, fixed by the base. The real stigma is a shelf or short lip on the lower face of the petal-like branch of the style, only its inner surface stigmatic. Pod 3–6-angled.

§ 2. *Perianth parted almost to the base into* 6 *nearly equal widely spreading divisions: stamens separate or nearly so: style* 3 – 6*-lobed.*

2. PARDANTHUS. Foliage and aspect of an Iris with leafy branching stem, from a rootstock. Divisions of the flower oblong with a narrow base. Filaments slender, much longer than the anthers. Style long, club-shaped, its simple branches tipped with a broad and blunt stigma. Pod pear-shaped; the valves falling away expose the centre covered with black berry-like seeds.

3. NEMASTYLIS. Stem simple or sparingly branching above, from a solid bulb like that of a Crocus. Divisions of the flower obovate. Filaments awl-shaped, much shorter than the linear anthers. Style short, its 3 lobes parted each into two, bearing long and thread-like diverging stigmas. Pod truncate. Seeds dry, angular.

§ 3. *Perianth deeply cleft or parted into* 6 *widely spreading divisions: stamens monadelphous to the top: style long: stigmas* 3 *or* 6, *thread-like: flowers opening in sunshine and but once for a few hours.*

4. SISYRINCHIUM. Root mostly fibrous: leaves grass-like. Divisions of the wheel-shaped flower all alike. Stigmas 3, simple.

5. TIGRIDIA. From a solid bulb with some hard brittle coating. Leaves lanceolate, large, very much plaited. Three outer divisions of the perianth very large and with a concave base; the other 3 very much smaller and fiddle-shaped. Stigmas 3, each 2-cleft.

§ 4. *Perianth tubular at base, the* 6 *divisions all more or less spreading: stamens separate: style long: stigmas* 3, *more or less dilated: flowers lasting for several days. Plants from solid bulbs or corms.* (Lessons, p. 46, fig. 105, 106.)

6. GLADIOLUS. Flowers numerous in a spike, on a rather tall leafy stem remaining open, irregular, the short-funnel-shaped tube being somewhat curved, and the divisions more or less unequal, the flower commonly oblique or as if somewhat 2-lipped. Stamens (inserted on the tube,) and style ascending. Leaves sword-shaped, strongly nerved.

7. CROCUS. Flowers and narrow linear leaves rising from the bulb, the ovary and pod seldom raised above ground: perianth with a long and slender tube; its oval or roundish divisions alike, or the 3 inner rather smaller, concave, fully spreading only in sunshine. Leaves with revolute margins.

There are besides many tender plants of the family in choice collections, the greater part confined to the conservatories, — mostly belonging to

Íxia maculàta, of Cape of Good Hope, and others, once of that genus, now called SPARÁXIS, WATSÒNIA, &c.; also to MONTBRÈTIA or TRITÒNIA, &c.

Schizóstylis coccínea, from South Africa, lately introduced: not very tender, with long and keeled linear leaves, and stems 3° high, bearing a spike of bright crimson-red flowers 2′ across, the ovate acute lobes all alike and widely spreading from a narrow tube; the slender style deeply cleft (whence the name) into 3 thread-like branches.

Moræa iridoìdes, of the Cape; very like an Iris, as the specific name denotes; but the 6 divisions of the perianth all nearly alike and widely spreading, white with a yellow spot on the 3 outer ones.

1. ÌRIS, FLOWER-DE-LUCE, BLUE FLAG. (Greek and Latin mythological name, and name of the *rainbow.*) Fl. spring and early summer.

§ 1. *Wild species of the country, all with creeping rootstocks.*

* *Dwarf, with simple very short stems (or only leafy tufts).* 1 – 3*-flowered in early spring, from creeping and branching slender rootstocks, here and there tuberous-thickened: flowers violet-blue, with a long slender tube, and no beard.*

I. vérna, SLENDER DWARF-IRIS. Wooded hillsides, from Virginia and Kentucky S.; with linear grassy leaves, tube of flower about the length of its almost equal divisions, which are on slender orange-yellow claws, the outer ones crestless.

I. cristàta, CRESTED D. Along the Alleghanies, &c., sometimes cult.; with lanceolate leaves, or the upper ovate-lanceolate, tube of flower (2′ long) much longer than the scarcely stalked divisions, the outer ones crested: pod sharply triangular.

* * *Taller: the several-flowered often branching stems 1°–3° high: tube of the flower short: the outer divisions naked, beardless, and all but one crestless; the inner very much smaller: fl. late spring and early summer, in swamps.*

I. Virgínica, Slender Blue Flag. Slender; with very narrow linear leaves, and blue flowers with some white (barely 2′ long), on slender peduncles, with hardly any tube beyond the 3-angled ovary.

I. versícolor, Larger Blue-Flag. Stout; stem angled on one side; leaves sword-shaped, ¾′ wide; flowers light blue variegated with some yellow, white, and purple, hardly 3′ long, the inflated tube shorter than the obtusely 3-angled ovary; pod oblong, 3-angled.

I. hexágona. Only S. near the coast; with simple stem, narrowish long leaves, and deep blue variegated flowers 4′ long, the outer divisions crested, the tube longer than the 6-angled ovary.

I. cùprea. Only S. and W.; with copperish-yellow flowers 2′ long, the tube about the length of the 6-angled ovary.

I. tripétala. Only S. in pine-barren swamps; with rather short sword-shaped glaucous leaves, and few blue flowers (2′–3′ long), variegated with yellow and purple, the inner divisions very short and wedge-shaped, the tube shorter than the 3-angled ovary.

§ 2. *Garden species from the Old World, cult. for ornament.*

* *A dense beard along the lower part of the 3 outer divisions of the flower: the stamens in all spring from thickened rootstocks.*

+– *Dwarf: flowering in early spring.*

I. pùmila, Dwarf Garden Iris. Stem very short; the violet and purple flower close to the ground, with slender tube and obovate divisions, hardly exceeding the short sword-shaped leaves.

+– +– *Taller and larger, several-flowered, in early summer.*

I. Germánica, Common Flower-de-Luce of the gardens, with very large scentless flowers, the deep violet pendent outer divisions 3′ long, the obovate inner ones nearly as large, lighter and bluer.

I. sambùcina, Elder-scented F., is taller, 3° or 4° high, and longer-leaved; the flowers about half as large as in the preceding, the outer divisions less reflexed, violet, but whitish and yellowish toward the base, painted with deeper-colored lines or veins; upper divisions pale grayish or brownish blue; spathe broadly scarious-margined.

I. squàlens, very like preceding, with longer dull violet outer divisions to the flower whitish and striped at base, and purplish-buff-colored inner divisions.

I. variegàta, has much smaller flowers, with spatulate-obovate divisions 2′ long, white with pale yellow, the outer divisions veined with dark-purple and purplish-tinged in the middle.

I. Florentìna, Florence or Sweet F. Less tall than the Common F., with broader leaves, and white faintly sweet-scented flowers, bluish veined, the obovate outer divisions 2½′–3′ long, with yellow beard. Its violet-scented rootstock yields *orris-root*.

* * *No beard nor crest to the flower: all but the last with rootstocks.*

I. Pseudácorus, Yellow Iris, of wet marshes in Europe, with very long linear leaves and bright yellow flowers, sparingly cultivated.

I. gramínea, Grass-Leaved I., has narrow linear root-leaves 2°–3° long and often surpassing the 1–3-flowered stem; flower purple-blue, with narrow divisions.

I. Pérsica, Persian Iris. A choice house-plant, dwarf, nearly stemless from a kind of bulb-like tuber, from which the flower rises on a long tube, earlier than the leaves, delicately fragrant, bluish, with a deep-purple spot at the tip of the outer divisions, the inner divisions very small and spreading.

2. PARDÁNTHUS, BLACKBERRY LILY. (Name from the Greek, means *pard-flower*, alluding to the spotted perianth.) Fl. late summer.

Pardánthus Chinénsis, from China, cult. in country gardens and escaping into roadsides: 3°–4° high, more branching than an Iris; the divisions of the orange-colored flower (1′ long) mottled above with crimson spots,

the fruit, when the valves fall and expose the berry-like seeds, imitating a blackberry, whence the common name.

3. NEMÁSTYLIS. (Name from the Greek, means *thread-like style*, applicable here to the stigmas.) Fl. spring and summer.

N. cœlestina. Pine barrens S.: 1°–2° high, with handsome but fugacious bright blue flowers; the leaves mainly from the small bulb, linear and plaited.

4. SISYRÍNCHIUM, BLUE-EYED GRASS. (Name in Greek means *hog's snout*, the application not apparent.) Fl. all summer.

S. Bermudiàna. In all moist meadows; the slender 2-winged stems 6′–12′ high, in tufts, longer than the root-leaves, almost naked; the small flowers in an umbel from a 2-leaved spathe, their obovate divisions bristle-tipped from a notch, pale blue, sometimes purplish, in a Western variety white.

5. TIGRÍDIA, TIGER-FLOWER (as the name denotes). Fl. summer.

T. pavònia, from Mexico, the principal species, with several varieties, planted out for summer flowering, sends up a stem 2° high, bearing in succession a few very large showy flowers 5′ or 6′ across, yellow or orange-red, the dark centre gaudily spotted with crimson or purple.

6. GLADÌOLUS, CORN-FLAG. (Name a diminutive of the Latin word for *sword*, from the leaves.) Several choice tender species in conservatories; while the hardy ones and those which bear planting out, which make our gardens gay in late summer and autumn, are from the following:

G. commùnis, of Europe, is the old-fashioned hardy species, with rather few rose-red (rarely white) flowers; the filaments longer than the anthers.

G. Byzantìnus, of the Levant, is larger in all its parts, with more flowers in the spike, and more showy; filaments shorter than the linear anthers.

G. blándus, of the Cape of Good Hope, is the parent of many of the tender white or pale rose-colored varieties.

G. cardinàlis, of the Cape, also tender, has large scarlet-red flowers, often white along the centre of its 3 lower divisions.

G. psittacìnus, of the Cape, is a tall and robust species, its numerous large flowers with very broad divisions, dull yellow, mixed or bordered with scarlet. This is the parent of G. Gandavénsis, now universally cultivated, and from which so many fine sub-varieties have been produced, with scarlet, red and yellow, orange, and other colors.

7. CRÒCUS. (The Greek name of *Saffron*.) Cult. from the Old World.

C. vérnus, Spring Crocus; with violet, purple, white or mixed colored flowers, the broad divisions rarely expanded, and short dilated stigmas with jagged margins.

G. lùteus and **C. Susiànus,** Yellow Crocus, with yellow or orange flowers, and opening wider, are mere varieties of the first.

C. sativus, Fall Crocus, with violet purple and fragrant flowers, in autumn, is rarely seen here. Its long and narrow orange-red stigmas are *saffron*.

122. DIOSCOREACEÆ, YAM FAMILY.

Twining plants, from tubers or thick rootstocks or roots, having ribbed and netted-veined petioled leaves more or less imitating those of Exogens, and small greenish or whitish dicœcious flowers, with the tube of the perianth in the fertile ones adhering to the 3-celled ovary; its 6 divisions regular and parted to near the base or to the ovary. Styles 3, distinct or nearly so. Ovules and seeds 1 or 2 in each cell.

Tàmus elephàntipes, or TESTUDINÀRIA ELAPHANTIPES, of the Cape of Good Hope, is a curiosity in conservatories; the globular or hemispherical trunk, resting on the ground, covered with very thick bark soon cracked into separate portions, and resembling the back of a tortoise; out of it spring every year slender twining stems, bearing rounded heart-shaped or kidney-shaped leaves.

1. DIOSCORÈA, YAM. (Named for *Dioscorides.*) Flowers in axillary panicles or racemes: stamens 6 in the sterile ones, separate. Fertile ones producing a 3-celled 3-winged pod, when ripe splitting through the wings. Fl. summer. ♃

D. villòsa, WILD YAM: sends up from a knotty rootstock its slender stems, bearing heart-shaped pointed leaves, either alternate, opposite, or some in fours, 9–11-ribbed and with prominent cross-veinlets. In thickets, commoner S.: slightly downy, or usually almost smooth, so that the specific name is not a good one.

D. Batàtas (or D. JAPÓNICA of some), CHINESE YAM: cult. from China and Japan, for ornament, or for its very deep and long farinaceous roots,—a substitute for potatoes, if one could only dig them; with very smooth heart-shaped partly halberd-shaped opposite leaves, and produces bulblets in the axils.

D. satìva, TRUE YAM, with great thick roots, is only of hot climates.

123. SMILACEÆ, SMILAX FAMILY.

Chiefly woody-stemmed plants, a few herbaceous, climbing or supported by a pair of tendrils on the sides of the petiole, having ribbed and netted-veined leaves and small dicœcious flowers, as in the foregoing; but the ovary is free from the perianth, bears mostly 3 long and diverging sessile stigmas, and in fruit is a berry; the anthers are only 1-celled, opening by one longitudinal slit (the division of the cell, if any, corresponding with the slit). Consists of the genus

1. SMÌLAX, GREENBRIER, CATBRIER, or CHINA-BRIER. (Ancient Greek name.) All wild species, in thickets and low grounds; flowers small, greenish, in clusters on axillary peduncles, in summer, or several of the Southern prickly ones in spring.

§ 1. *Stems woody, often prickly: ovules and seeds only one in each cell.*

* *Smooth, and the leaves often glossy,* 5–9-*ribbed: stigmas and cells of ovary* 3.

+ *Berries red: peduncles short: leaves* 5-*ribbed: prickles hardly any.*

S. lanceolàta, from Virginia S.: climbs high; leaves evergreen, lance-ovate or lanceolate, acute at both ends; rootstock tuberous.

S. Wàlteri, from New Jersey S.: 6° high; leaves deciduous, ovate or lance-oval, roundish or slightly heart-shaped; peduncles flat; rootstock creeping.

+ *Berries black, often with a bloom: leaves mostly roundish or somewhat heart-shaped at base: peduncles almost always flat.*

S. rotundifòlia, COMMON GREENBRIER. Yellowish-green, often high-climbing; branchlets more or less square, armed with scattered prickles; leaves ovate or round-ovate, thickish, green both sides, 2′–3′ long; peduncles few-flowered, not longer than the petioles.

S. glaùca. Mostly S. of New York: like the preceding, but less prickly, the ovate leaves glaucous beneath and seldom at all heart-shaped, smooth-edged, and peduncles longer than petiole.

S. tamnoìdes. New Jersey to Ill. and S.: differs from preceding in the leaves varying from round-heart-shaped to fiddle-shaped and halberd-shaped, green both sides, pointed, and the edges often sparsely bristly.

S. Pseudo-Chìna, CHINA-BRIER; from New Jersey and Kentucky S.: rootstock tuberous; prickles none or rare; leaves ovate and heart-shaped, green both sides, often contracted in the middle, and rough-ciliate, 3′–5′ long; flat peduncles 2′–3′ long.

S. hìspida. Only from Penn. N.: rootstock long; stem high-climbing, below beset with long and dark bristly prickles; leaves ovate and heart-shaped, green both sides, thin, 4′-5′ long; flat peduncles 1½′-2 long; flowers larger than in the Common Greenbrier.

* * *Downy or smooth: stigma, cell of the ovary, and seed only one!*

S. pùmila. Sandy soil S.: rising only 1°-3° high, not prickly, soft-downy, with ovate or oblong and heart-shaped 5-ribbed evergreen leaves, when old smooth above; peduncles twice as long as petioles, densely-flowered; berries whitish.

S. laurifòlia. From pine-barrens of New Jersey S.: very smooth, high-climbing, stem with some prickles; leaves thick, evergreen, glossy, varying from ovate to lanceolate, 3-nerved; peduncles not exceeding the petiole and pedicels; berries black.

§ 2. *Stems herbaceous, never prickly, smooth: leaves long petioled, thin: ovules and seeds usually a pair in each cell: berries blue-black with a bloom.*

S. herbàcea, Carrion Flower (the scent of the blossoms justifies the name): common in moist ground; erect and recurving, often without tendrils, or low-climbing, very variable in size, generally smooth; leaves ovate-oblong or roundish and mostly heart-shaped, 7-9-nerved; peduncles sometimes short, generally 3′-4′ or even 6′-8′ long, even much surpassing the leaves, 20-40-flowered.

S. tamnifòlia. Pine barrens from New Jersey S.: differs in its heart-shaped and some halberd-shaped only 5-nerved leaves; peduncles rather longer than the petioles, and berry fewer-seeded.

124. LILIACEÆ, LILY FAMILY.

Large family, known as a whole by its regular symmetrical flowers, with perianth of 6 (in one instance of 4) parts, as many stamens with 2-celled anthers, and a free 3-celled (rarely 2-celled) ovary. Perianth either partly or wholly colored, or greenish, but not glumaceous. Flowers not from a spathe, except in Allium, &c. Chiefly herbs, with entire leaves; all perennials. The great groups comprised are the following.

I. TRILLIUM FAMILY; with netted-veined leaves all in one or two whorls on an otherwise naked stem, which rises from a fleshy rootstock: styles or sessile stigmas 3, separate down to the ovary. Fruit a berry.

1. TRILLIUM. Perianth of 3 green persistent sepals, and 3 colored petals; the latter at length withering away after flowering, but not deciduous. Anthers linear, adnate, on short filaments, looking inwards. Awl-shaped styles or stigmas persistent. Ovary 3-6-angled. Berry purple or red, ovate, many-seeded.
2. MEDEOLA. Perianth of 6 oblong and distinct nearly similar pieces, recurved, deciduous. Anthers oblong, shorter than the slender filaments. Stigmas or styles long and diverging or recurved on the globular ovary, deciduous. Berry dark-purple, few-seeded.

II. MELANTHIUM FAMILY; with alternate and parallel-veined leaves; stem simple, at least up to the panicles; and flowers often polygamous, sometimes diœcious; styles or sessile stigmas 3, separate down to the ovary. Fruit a pod. Anthers almost always turned outwards. Perianth withering or persisting, not deciduous, the 6 parts generally alike. Mostly acrid or poisonous plants, some used in medicine.

§ 1. *Stemless: the large flower with a long tube rising directly from a thin-coated solid bulb or corm: anthers* 2*-celled.*

3. COLCHICUM. Perianth resembling that of a Crocus. Stamens borne on the throat of the long-tubular perianth. Styles very long.

§ 2. *Perianth without any tube, of* 6 *distinct or almost separate divisions.*

* *Anthers* 2*-celled, short: flowers in a simple raceme or spike: pod loculicidal.*

4. CHAMÆLIRIUM. Flowers diœcious or mostly so. Perianth of 6 small and narrow white pieces. Pod ovoid-oblong, many-seeded. Spike or raceme slender.
5. HELONIAS. Flowers perfect, in a short dense raceme, lilac-purple, turning green in fruit; the divisions spatulate-oblong, spreading. Filaments slender: anthers blue. Pod 3-lobed; cells many-seeded.
6. XEROPHYLLUM. Flowers perfect, in a compact raceme, white; the divisions oval, sessile, widely spreading, naked. Filaments awl-shaped. Pod globular, 3-lobed, with 2 wingless seeds in each cell.

* * *Anthers kidney-shaped or round heart-shaped, the two cells confluent into one, shield-shaped after opening: styles awl-shaped: pod* 3*-horned, septicidal: seeds commonly flat or thin-margined.*

7. AMIANTHIUM. Flowers perfect, mostly in a simple raceme. Perianth white, the oval or obovate spreading divisions without claws or spots. Filaments long and slender. Seeds wingless, 1–4 in each cell. Leaves chiefly from the bulbous base of the scape-like stem, linear, keeled, grass-like.
8. STENANTHIUM. Flowers polygamous, in panicled racemes on a leafy stem. Perianth white, with spreading and not spotted lanceolate divisions tapering to a narrow point from a broader base, which coheres with the base of the ovary. Stamens very short. Seeds several, wingless. Leaves linear, keeled, grass-like.
9. VERATRUM. Flowers polygamous, in panicled racemes. Perianth greenish or brownish, its obovate-oblong divisions narrowed at base, free from the ovary, not spotted. Filaments short. Seeds rather numerous, wing-margined. Leaves broad, many-nerved. Base of the leafy stem more or less bulb-like, producing many long white roots.
10. MELANTHIUM. Flowers polygamous, in racemes forming an open pyramidal panicle. Perianth cream-colored, turning green or brownish with age, perfectly free from the ovary, its heart-shaped or oblong and partly halberd-shaped widely spreading divisions raised on a claw and marked with a pair of darker spots or glands. Filaments short, adhering to the claws of the perianth, persistent. Seeds several in each cell, broadly winged. Leaves lanceolate or linear, mostly grass-like. Stem roughish-downy above, its base more or less bulbous.
11. ZYGADENUS. Flowers pefect or polygamous, in a terminal panicle. Perianth greenish white, its oblong or ovate widely spreading divisions spotted with a pair of roundish glands or colored spots near the sessile or almost sessile base. Stamens free from and about the length of the perianth. Leaves linear, grass-like; stem and whole plant smooth.

III. BELLWORT FAMILY; with alternate and broad not grass-like parallel-veined leaves: stem from a rootstock or from fibrous roots, branching and leafy: style one at the base, but 3-cleft or 3-parted. Fruit a pod, few-seeded. Anthers turned rather outwards than inwards. Perianth of 6 almost similar and wholly separate pieces, deciduous. Not acrid nor poisonous. Plants intermediate between the preceding groups and the next.

12. UVULARIA. Flowers solitary or sometimes in pairs at the end or in the forks of the forking stem, drooping, yellowish; the perianth rather bell-shaped and lily-like, its divisions spatulate-lanceolate, with a honey-bearing groove or pit at the erect narrowed base. Stamens short, one at the base of each division: anthers linear, much longer than the filaments. Pod triangular or 3-lobed, loculicidal from the top. Seeds thick and roundish.

IV. ASPARAGUS FAMILY; with parallel-veined mostly alternate leaves, branching or simple stems from a rootstock, at least there is no bulb, a single style (if cleft or lobed at all only at the summit), and fruit a few several-seeded berry. Pedicels very often with a joint in the middle or under the flower. Flower almost always small, and white or greenish, chiefly perfect.

§ 1. *Herbs with ordinary broad leaves.*

* *Flowers bell-shaped, of 6 separate and similar deciduous divisions: stamens on the receptacle or nearly so: anthers turned outwards.*

13. CLINTONIA. Flowers erect, few or several in an umbel on a naked scape, the base of which is sheathed by the stalks of a few large oval or oblong and ciliate root-leaves. Filaments long and slender; anthers linear or oblong; style long. Ovary 2–3-celled, becoming a blue berry. Rootstocks creeping, like those of Lily-of-the-Valley, which the leaves also resemble.
14. PROSARTES. Flowers single or few, hanging at the end of the leafy spreading branches on slender simple stalks, yellowish. Divisions of the perianth lanceolate or linear. Filaments much longer than the linear-oblong blunt anthers. Ovary with a pair of hanging ovules in each of the 3 cells, becoming an ovoid or oblong and pointed red berry. Rootstock short, not creeping: herbage downy.
15. STREPTOPUS. Flowers single or rarely in pairs along the leafy and forking stem, just out of the axils of the ovate clasping leaves: the slender peduncle usually bent in the middle. Divisions of the perianth lanceolate, acute, the three inner ones keeled. Anthers arrow-shaped, on short and flattish filaments. Ovary 3-celled, making a red many-seeded berry.

* * *Flowers with perianth of one piece, but often deeply parted, the stamens on its base or tube: anthers turned inwards: stems not branched.*

16. CONVALLARIA. Flowers nodding in a one-sided raceme, on an angled scape which rises, with the about two oblong leaves, from a running rootstock. Perianth short bell-shaped, with 6 recurving lobes. Stamens included. Style stout. Ovary with several ovules, becoming a few-seeded red berry.
17. SMILACINA. Flowers in a raceme or cluster of racemes terminating a leaf-bearing stem, small, white. Perianth 6-parted, in one 4-parted. Filaments slender: anthers short. Ovary 2–3-celled, making a 1–2-seeded berry. Rootstocks mostly creeping.
18. POLYGONATUM. Flowers nodding in the axils of the leaves along a leafy and recurving simple stem, which rises from a long and thickened rootstock. Perianth greenish, cylindrical, 6-lobed or 6-toothed, bearing the 6 included stamens at or above the middle of the tube. Style slender. Ovary 3-celled with few ovules in each cell, in fruit becoming a globular black or blue few-seeded berry.

§ 2. *Plants with small scales in place of leaves, from the axils of which are produced false-leaves, i. e. bodies which by their position are seen to be of the nature of branches, but which imitate and act as leaves. Perianth greenish or whitish, 6-parted, the stamens borne on its base. Berry 3-celled, the cells 2-seeded.*

19. ASPARAGUS. Flowers greenish-yellow, bell-shaped, scattered along the much divided branches. Styles short: stigma 3-lobed. The so-called leaves very narrow.
20. MYRSIPHYLLUM. Flowers 2 or 3 in the axils, greenish-white; the linear-oblong divisions of the perianth recurved. Stamens almost as long as the perianth. Style slender: stigma entire. The so-called leaves lance-ovate. Stems twining.

V. LILY FAMILY PROPER (including Asphodel Family): distinguished by the single undivided style (or rarely a sessile stigma), and fruit a loculicidal pod. Perianth with all 6 parts generally corolla-like, and in all the following nearly similar. Leaves parallel-veined or ribbed, sometimes with netted-veins also. Stem or scape mostly simple.

§ 1. *From a coated or sometimes scaly bulb.*

* *Stem leafy, especially above, the leaves often whorled or crowded: divisions of the perianth with a honey-bearing furrow or spot at or near the base: style long: stigmas or lobes* 3: *pod packed with* 2 *rows of depressed and flat soft-coated seeds in each cell. Flowers large, often several.*

21. LILIUM. Flower bell-shaped or funnel-form with the separate or partly united divisions spreading or recurved above: the honey-bearing-groove beginning at their base. Anthers linear, at first erect, at length versatile. Pod oblong. Bulb mostly scaly (Lessons, p. 47, fig. 107 – 109.)
22. FRITILLARIA. Divisions of the bell-shaped flower distinct, not at all recurving; the honey-bearing spot above their base. Bulb coated or scaly. Flowers always nodding, often spotted.

* * *Stem* 2*-leaved or few-leaved at or towards the base, naked above and ordinarily* 1*-flowered at summit: the six pieces of the bell-shaped perianth separate: stamens on the receptacle or nearly so: anthers erect: seeds many, pale.*

23. TULIPA. Stem 1 – 2-leaved above the ground, bearing an erect large flower. Divisions of the perianth broad, not recurved nor spreading. Ovary and pod triangular, columnar: stigmas 3, sessile. Seeds nearly as in Lily.
24. ERYTHRONIUM. Scape 2-leaved from the ground, bearing a nodding flower. Divisions of the perianth lanceolate, recurved or spreading above. Ovary and pod obovate: seeds globular. Style long, more or less club-shaped.

* * * *Scape naked, bearing several or many flowers: seeds very few, globular or angled, mostly with a crustaceous or brittle black coat.*

+ *Perianth* 6*-parted or* 6*-sepalled, either wheel-shaped or less widely spreading.*

25. ORNITHOGALUM. Flowers in a corymb, bracted, white, wheel-shaped. Style 3-sided: stigma 3-angled.
26. ALLIUM. Flowers in a simple umbel, from a 1 – 2-leaved or scarious spathe. Style persistent, slender: stigma entire.
27. SCILLA. Flowers in a simple raceme, mostly blue. Style slender.

+ + *Perianth merely* 6*-toothed or* 6*-cleft, bearing the short included stamens on its tube: pod triangular.*

28. MUSCARI. Flowers in a raceme; the globular or urn-shaped narrow-mouthed perianth nearly 6-toothed.
29. HYACINTHUS. Flowers in a raceme; the short-funnel-shaped or bell-shaped perianth 6-cleft, the lobes spreading.

§ 2. *Scape and leaves from a tuberous rootstock or fibrous-rooted crown: no bulb.*

* *Stamens and styles long and slender, declined: stigma nearly simple: flowers large.*

30. AGAPANTHUS. Flowers in a 2-bracted umbel, blue. Perianth tubular at base, with 6 widely spreading divisions nearly regular. Pod triangular, many seeded. Seeds flat, brownish, winged above. Leaves linear, flat.
31. FUNKIA. Flowers in a raceme, blue or white. Perianth funnel-form, 6-cleft, the lobes hardly spreading, somewhat irregular. Pod oblong, prismatic, many-seeded. Seeds flat, black, with a soft and thin coat, winged at the apex. Leaves ovate or heart-shaped, netted-veiny between the ribs, and on long petioles.
2. HEMEROCALLIS. Flowers few on a somewhat branching scape, yellow, lasting but a day. Perianth funnel-form, with short narrow tube closely investing the ovary; the nearly similar divisions more or less spreading. Pod thick, at first fleshy. Seeds few in each cell, roundish, with a hard and brittle black coat. Leaves linear, grassy, keeled.

* * *Stamens and style straight, protruding from the tubular perianth.*

33. TRITOMA. Flowers very many, nodding in a dense raceme or spike on a bracted scape. Perianth tubular, regular, red or yellow, 6-toothed. Filaments of two lengths. Pod many-seeded. Leaves narrow-linear, long and grassy, keeled, crowded at the root.

§ 3. *Stem a woody trunk, either short or tree-like, bearing a crowd of rigid and pungent-pointed sword-shaped persistent leaves: no bulb.*

32. YUCCA. Flowers in an ample terminal compound panicle, large, often polygamous, white or whitish. Perianth of 6 separate oval or oblong acute divisions, not deciduous, the 3 inner broader, longer than the stamens. Stigmas 3, sessile. Pod oblong, many-seeded; the depressed seeds as in Lily.

Among the various cultivated plants of the choicer collections, the following are not rarely met with.

* *Not bulbous.*

Phormium tènax, New Zealand Flax. Nearly hardy N., but does not flower; the very firm finely nerved linear evergreen leaves tufted on matted rootstocks, strongly keeled, conduplicate below, nearly flat above, yielding a very strong fibre for cordage.

Dracæna and **Cordyline,** Dragon-Trees, two or three species, ornaments of choice conservatories, cult. for their foliage.

Aloe angulàta, A. variegàta, and other Aloes, with very thick and fleshy 2-ranked leaves crowded or imbricated at the ground, sending up a slender scape, bearing a spike or raceme of tubular flowers; in conservatories.

* * *From coated bulbs, sending up leaves and scapes.*

Lachenália trícolor; tender bulb from Cape of Good Hope; with lanceolate soft leaves blotched with purple, and a raceme of small, rather singular than handsome, greenish-purple and yellow flowers, its erect divisions connivent, the three interior longer.

Calochórtus, Cyclobòthra, Brodiæa, and **Tritelèia,** handsome flowered bulbs, chiefly from California and Oregon, hardly any quite hardy N.

1. TRÍLLIUM, THREE-LEAVED NIGHTSHADE, WAKE ROBIN, BIRTHROOT. (Name from Latin *trilix*, triple, the parts throughout being in threes.) Low stem from a short tuber-like rootstock (Lessons, p. 44, fig. 160), bearing a whorl of three green conspicuously netted-veined ovate or rhomboidal leaves, and a terminal flower, in spring. All grow in rich or moist woods, or the last in bogs.

§ 1. *Flower sessile: petals and sepals narrow, the former spatulate, dull purple.*

T. séssile. From Penn. W. & S.: leaves sessile, often blotched; petals sessile, rather erect, turning greenish, long persisting.

T. recurvàtum. Only W.: differs in having the leaves narrowed at base into a petiole, sepals reflexed, and pointed petals with a narrowed base.

§ 2. *Flower raised on a peduncle: petals withering away soon after flowering.*

* *Peduncle erect or inclined: leaves rhombic-ovate, sessile by a wedge-shaped base, abruptly taper-pointed: petals flat.*

T. grandiflòrum, Great-flowered White T. From Vermont to Penn. and W., flowering rather late: handsome, the obovate petals $2' - 2\frac{1}{2}'$ long, much larger than the sepals, gradually recurving from an erect base, pure white, in age becoming rose-colored.

T. eréctum, Purple T. or Birthroot. Chiefly N.: not so large as the preceding; the dark dull purple petals ovate, widely spreading, little longer than the sepals, $1' - 1\frac{1}{2}'$ long.

Var. **álbum,** from New York W.: has greenish white, rarely yellowish petals.

Var. **declinátum,** from Ohio N. W., has peduncle fully half the length of the leaves and horizontal, or in fruit even reflexed; petals white or pinkish.

* * *Peduncle recurved from the first under the short-petioled or almost sessile leaves, not longer than the ovary and recurved white petals.*

T. cérnuum, Nodding T. Commonest E.: leaves rhombic-ovate; petals oblong, ovate, acute, $\frac{1}{2}' - \frac{3}{4}'$ long; styles separate.

T. stylòsum. Upper country S.: leaves oblong, tapering to both ends; petals oblong, tinged with rose-color, much longer and broader than the sepals; styles united at base.

* * * *Peduncle nearly erect; leaves rounded at the base and short-petioled.*

T. nivàle, Dwarf White T. From Ohio N. W.: very early-flowering, $2' - 4'$ high; leaves oval or ovate, obtuse; petals oblong, obtuse, pure white, $1'$ long; styles slender.

T. erythrocárpum, PAINTED T. Low woods or bogs N.: leaves ovate, taper-pointed; petals lance-ovate, pointed, wavy, white with pink stripes at the base; berry bright red.

2. MEDÈOLA, INDIAN CUCUMBER-ROOT (from the taste of the tuberous white and horizontal rootstock; the Latin name from *Medèa,* the sorceress). Fl. early summer.

M. Virgínica, the only species: in woods: simple stem 1°–3° high, cottony when young, bearing near the middle a whorl of 5–9 obovate-lanceolate thin and veiny but also parallel-ribbed leaves, and another of 3 (rarely 4 or 5) much smaller ovate ones at the top, around an umbel of a few small recurved-stalked flowers.

3. CÓLCHICUM. (Named from the country, *Colchis.*) Flowers in autumn, sends up the lanceolate root-leaves the next spring. Sparingly cult. from Eu. for ornament.

C. autumnàle, COMMON C., mostly with rose-purple or lilac flowers.
C. variegatum, perhaps a variety, has shorter and wavy leaves, and perianth variegated with small purple squares, as if tessellated.

4. CHAMÆLÍRIUM, DEVIL'S BIT. (Name in Greek means *Ground Lily,* of no obvious fitness.) Fl. summer.

C. lùteum, also called BLAZING-STAR: low grounds, commoner W. & S.: rootstock short and abrupt, sending up a stem 1°–3° high, bearing flat lanceolate leaves at base, some shorter ones up the stem, and a wand-like spike or raceme of small bractless flowers, the sterile ones from the stamens appearing yellow.

5. HELÒNIAS. (Name probably from the Greek for a swamp, in which the species grows.) Fl. spring.

H. bullàta. Rare and local plant, from New Jersey to E. Virginia, but sometimes cult.: very smooth, the tuberous stock producing a tuft of oblong or lance-spatulate evergreen leaves, from the centre of which rises in spring a leafless scape 1°–2° high, bearing the rather handsome flowers.

6. XEROPHÝLLUM. (Name means, in Greek, *arid-leaved,* the narrow leaves being dry and rigid.) Fl. early summer.

X. asphodelioides. Pine barrens, from New Jersey S.: a striking plant, with the aspect of an Asphodel; simple stout stem rising 2°–4° high from a thick or bulb-like base, densely beset at base with very long needle-shaped rigid recurving leaves, above with shorter ones, which at length are reduced to bristle-like bracts; the crowded white flowers showy.

7. AMIÁNTHIUM, FLY-POISON. (Name, from the Greek, alludes to the flowers destitute of the spots or glands of Melanthium and Zygadenus.) Flowers summer, turning greenish or purplish with age.

A. muscætóxicum, BROAD-LEAVED F. Open woods from New Jersey S.: with a rather large bulb at the base of the stem, bearing many broadly linear (½′–1′ wide) blunt leaves; raceme dense; flowers rather large; seeds few, red and fleshy.

A. angustifòlium. Pine barrens S.: stem hardly bulbous at base, 2′ high; leaves narrow, acute, pale; seeds linear, not fleshy.

8. STENÁNTHIUM. (Name from Greek means *narrow flower.*) Fl. summer.

S. angustifòlium. Low meadows and prairies, from Penn. S. & W.: 2°–6° high, leafy, the leaves long and narrow; flowers only ¼′ long, in a prolonged terminal and many shorter lateral racemes, making an ample light panicle.

9. VERÀTRUM, FALSE HELLEBORE. (Old name, from Latin *vere ater*, truly black.) Mostly pubescent stout herbs; the roots yield the acrid poisonous *veratrin*. Flowers summer.

V. víride, American White Hellebore, or Indian Poke. Swamps, mostly N.: stout stem 2°–4° high, thickly beset with the broadly oval or ovate strongly plaited sheath-clasping leaves; panicle of spike-like racemes pyramidal; flowers yellowish-green turning greener with age.

V. parviflòrum, along the Alleghanies, is slender, 2°–5° high, with scattered oval or lanceolate scarcely plaited leaves below, and a long and loose panicle of greenish small flowers turning dingy or brownish with age.

10. MELÁNTHIUM. (Name, from the Greek, means *black flower*, the perianth turning darker, yet not black.) Fl. summer.

M. Virgínicum, Bunch-flower. Moist grounds, from S. New York S. & W.: 3°–5° high; lowest leaves sometimes 1′ wide, the upper few and small; flowers rather large.

11. ZYGADÈNUS. (Name in Greek means *yoked glands.*) Fl. summer.

Z. glabérrimus. Pine barren bogs S.: 1°–3° high, from a running rootstock; leaves rather rigid, keeled, nerved, taper-pointed; panicle many-flowered; divisions of perianth ½′ long, a pair of round spots above the narrowed base.

Z. glaùcus. Bogs along our N. borders: 1°–3° high, from a bulb; leaves flat, pale; flowers rather few; base of perianth coherent with that of the ovary, the divisions marked with an inversely heart-shaped spot.

12. UVULÀRIA, BELLWORT. (Name from the Latin *uvula*, or palate; the application obscure.) Stems 6′–2° high, naked below, leafy above: fl. spring. All in rich woods.

* *Leaves oblong, the base clasping round the stem which seems to run through the blade just above its base* (Lessons, p. 60, fig. 162): *pod 3-lobed: rootstock very short and erect.*

U. grandiflòra, the common one from W. New England W.: with pale greenish-yellow flower 1½′ long and smooth or nearly so inside.

U. perfoliàta, common E. & S.: smaller, with sharper tips to the anthers, and the parts of the barely yellowish perianth granular-roughened inside.

U. flàva, chiefly N. E., with bright yellow flower about 1′ long, and nearly smooth inside.

* * *Leaves not surrounding the stem, merely sessile: rootstock creeping: pod sharply triangular.*

U. sessilifòlia, common, especially N.: 6′–12′ high, with pale lance-oblong leaves, and whitish cream-colored flower ¾′ long; pod stalked.

13. CLINTÒNIA. (Named for *De Witt Clinton* of New York.) Cold moist woods: flowers early summer.

C. boreàlis. Only N. and along the mountains; flowers 2–7, greenish yellow, over ½′ long; berry rather many-seeded.

C. umbellàta. Along the Alleghanies; flowers numerous, ¼′ long, white speckled with green or purplish dots; seeds only 2 in each cell.

14. PROSÁRTES. (Name from Greek word meaning *hanging.*)

P. lanuginòsa. Rich woods the whole length of the Alleghany region to Canada: branches widely spreading; leaves ovate-oblong, pointed, rounded or slightly heart-shaped at the sessile base; flowers ½′ long, greenish; style with 3 stigmas: fl. late spring.

15. STRÉPTOPUS, TWISTED-STALK (which the name denotes in Greek). In cold damp or wet woods N.: flowers in late spring and early summer, small, barely ½′ long.

S. amplexifòlius. Stem stout, rough at base, 2° – 3° high; leaves strongly clasping, smooth, glaucous beneath; flower whitish, on a long stalk with abrupt bend above the middle; anthers slender-pointed; stigma truncate.

S. ròseus. Stem 1° – 2° high; leaves green, finely ciliate, and with the few branches beset with more short and fine bristly hairs; flower rose-purple, on a less bent stalk; anthers 2-horned; stigma 3-cleft.

16. CONVALLÀRIA, LILY-OF-THE-VALLEY. (Name altered from the Latin *Lilium convallium,* of which the English name is a translation.) Fl. late spring.

C. majàlis, the only true species, cult. everywhere, from Europe, and wild on the higher Alleghanies; its small sweet-scented white flowers familiar.

17. SMILACÌNA, FALSE SOLOMON'S SEAL. (Name a diminutive of Smilax, which these plants do not resemble.) Wild in woods or low grounds: fl. late spring.

§ 1. *Perianth of only* 4 *reflexed spreading divisions: stamens* 4: *ovary* 2-*celled.*

S. bifòlia. In all moist woods N.: 3′ – 6′ high; stem bearing 2 (sometimes 3) heart-shaped leaves, and a short raceme of small flowers; berries red.

§ 2. *Perianth of* 6 *divisions: stamens* 6: *ovary* 3-*celled, rarely* 2-*celled.*

S. trifòlia. Cold bogs N.: 3′ – 6′ high, smooth, with mostly 3 oblong leaves tapering to a sheathing base; raceme loose, few-flowered; berries red.

S. stellàta. Rocky places N.: 1° – 2° high, smooth, or the 7 – 12 lance-oblong leaves minutely downy when young; raceme several-flowered; berries blackish.

S. racemòsa. Moist copses and banks, chiefly N.: 2° high, minutely downy, leafy to the top; the oblong or lance-oval leaves ciliate, pointed at each end; flowers small, crowded in a compound raceme; the divisions of perianth narrow; berries pale red and speckled.

18. POLYGONÀTUM, SOLOMON'S SEAL. (Name in Greek means *many-jointed.* The English name is from the rootstocks, the impression of the seal being the scar left by the death and separation of the stem of a former year: Lessons, p. 44, fig. 99.) Stem recurving or turned to one side. Fl. late spring and early summer.

P. biflòrum, SMALLER S. Wooded banks: 1° – 3° high; the ovate-oblong or lance-oblong leaves nearly sessile and glaucous or minutely whitish-downy beneath; peduncles mostly 2-flowered; filaments roughened, borne above the middle of the tube.

P. gigantèum, LARGER S. Alluvial grounds N.: 3° – 8° high, smooth; leaves ovate, partly clasping; peduncles 2 – 8-flowered; filaments smooth and naked, borne on the middle of the tube.

19. ASPÁRAGUS. (The ancient Greek name.) Fl. early summer.

A. officinàlis, COMMON ASPARAGUS. Cult. from Eu. for its esculent spring shoots, spontaneous about gardens: tall, bushy-branched, the leaves thread-shaped.

20. MYRSIPHÝLLUM. (The name in Greek means *myrtle-leaved.*)

M. asparagoìdes, of Cape Good Hope: a very smooth delicate twiner, cult. in conservatories for winter decoration, under the name of SMILAX: the bright green so-called leaves 1′ or more long, glossy-green both sides, nerved, set edgewise on the branch, but turning so as to present an upper and under face; the small flowers produced in winter, sweet-scented, with reddish anthers; berries green. — That the seeming leaves are of the nature of branches is shown in RUSCUS, the BUTCHER'S BROOM, of Europe (here rarely cultivated), where they are rigid, spiny-tipped, and bear flowers on one face.

21. LÍLIUM, LILY. (The classical Latin name, from the Greek.) All, including our four wild Lilies, more or less commonly cultivated: fl. summer.

§ 1. *Flowers erect, orange or orange-red, of bell-shaped outline, the divisions widely separate and on slender claws: no bulblets in the axils of the leaves. Wild species of sandy soil.*

L. Philadélphicum, WILD ORANGE-RED LILY. Chiefly N. & W.: 1°–2° high, with lanceolate or lance-linear leaves nearly all in whorls of 5–8, and 1–3 open-bell-shaped reddish-orange flowers, 2½′–3′ long, spotted inside with dark purple.

L. Catesbæi, SOUTHERN RED L. Chiefly S.: 1°–2° high, with scattered linear-lanceolate leaves, a solitary and larger nearly scarlet flower; the oblong-lanceolate divisions wavy-margined, recurving above, 3′–4′ long, with very slender claws, within crimson-spotted on a yellow ground.

§ 2. *Flowers erect, orange; the oblong divisions without claws, conniving at the broad base, the upper part spreading.*

L. bulbíferum, BULBLET-BEARING L. Cult. in old gardens, from Europe: 1½°–3° high, producing bulblets in the axils of the lanceolate irregularly scattered leaves, and few reddish-orange flowers, the divisions 2′–2½′ long, with some rough brownish projections at base inside, but hardly spotted.

§ 3. *Flowers nodding; the divisions without claws, rolled back, mostly dotted inside.*

* *Bulblets in the axils of the leaves.*

L. tigrìnum, TIGER BULBLET-BEARING L. Cult. from China: stem 4°–5° high, cottony; leaves lanceolate, scattered; flowers panicled, numerous, very showy, orange-red, the divisions about 4′ long, black-spotted inside.

* * *No bulblets in the axils.*

+ *Wild species of the country in moist meadows and bogs: flowers orange or orange-red, strongly dark-spotted inside.*

L. Canadénse, CANADA L. Stem 2°–5° high, bearing few or several long-peduncled flowers; leaves lanceolate, all in whorls, their edges and nerves minutely rough; divisions of the flower 2′–3′ long, recurved-spreading above the middle.

L. superbum, AMERICAN TURK'S CAP L. Stem 3′–7′ high, bearing few or many flowers in a pyramidal panicle: leaves lanceolate, smooth, imperfectly whorled or many of them scattered; divisions of the flower strongly rolled backwards, about 3′ long.

L. Caroliniànum, CAROLINA L., in the low country S., appears to be a variety of the above, 2°–3° high, with broader leaves and only 1–3 flowers more variegated with yellow.

+ + *Cultivated species from the Old World.*

L. Pompònium, TURBAN L., of Europe: slender, with scattered and crowded lance-linear or lance-awl-shaped leaves, and several small orange-red or scarlet (rarely white) flowers, their lanceolate acute divisions somewhat bearded inside. This and the next small-flowered, and not common in gardens.

L. Chalcedónicum, RED L. of Palestine and throughout the East; stem thickly beset with scattered narrow lance-linear erect leaves, their margins rough-pubescent; flowers several, scarlet or vermilion, the divisions bearded towards the base within, not spotted.

L. Mártagon, TURK'S CAP or MARTAGON L., of Europe: 3°–5° high, with lance-oblong leaves in whorls, their edges rough, and a panicle of rather small but showy light violet-purple or flesh-color (rarely white) flowers dotted with small brown-purple spots.

L. speciòsum, of Japan: stem 1°–3° high; leaves scattered, lance-ovate or oblong, pointed, slightly petioled; flowers few, odorous, the strongly revolute divisions about 5′ long, white or pale rose-color, with prominent purple warty projections inside: now of many varieties.

L. auràtum, GOLDEN-BANDED L., of Japan: stem 1°–2° high: leaves lanceolate, scattered; flowers 1–3, barely nodding, sweet-scented, very large,

the ovate-lanceolate divisions 6′ or more long, spreading almost from the base and the tips revolute, white with a light yellow band down the middle of the upper face, which is spotted all over with prominent purple spots and rough with bristly projections near the base. Probably a Japanese hybrid of the preceding with some other: the most showy species known.

§ 3. *Flowers inclined, white, more or less funnel-form in outline; the naked sessile divisions conniving or somewhat united below into a tube, their summits more or less spreading, but hardly recurving. All cultivated, from Asia, with scattered leaves.*

L. cándidum, Common White Lily. Cult. from Persia, &c.: with lanceolate leaves, and few or several bell-shaped flowers, smooth inside, sometimes double.

L. Japónicum, Japan White L. Cult. from Japan: 2° high, with mostly only one flower, which is nodding and larger than in the foregoing, below connivent into a narrower tube, and above with the divisions more widely spreading.

L. longiflòrum, Long-fl. White L., of Japan: 1° high, with lanceolate leaves, and a single horizontal funnel-form flower, 5′ or 6′ long, the narrow tubular portion longer than the rather widely spreading portion.

22. FRITILLÀRIA. (Latin *fritillus*, a dice-box, from the shape of the flower, which differs from a Lily in its more cup-shaped outline, the divisions not spreading.) Fl. spring.

F. Meleàgris, Guinea-Hen Flower. Cult. from Eu.: 1° high, with linear alternate leaves, mostly solitary terminal flower purplish, tessellated with blue and purple or whitish; the honey-bearing spot narrow.

F. imperiàlis, or Petílium imperiale, Crown Imperial. Cult. from Asia: a stately herb of early spring, 3°–4° high, rather thickly beset along the middle with lanceolate or lance-oblong bright green leaves more or less in whorls; flowers several hanging in a sort of umbel under the terminal crown or tuft of leaves, large, orange yellow, or sometimes almost crimson, a round pearly gland on the base of each division; pod 6-angled.

23. TÙLIPA, TULIP. (Name and the common species said to come from Persia.) Fl. spring and early summer: all from the Old World.

T. Gesneriàna, Common T., from Asia Minor, is the original of the various ordinary hardy kinds; leaves lance-oblong, glaucous, shorter than the flower-stalk; divisions of the flower very obtuse.

T. suavéolens, Sweet T. of Eu.: low; flower sweet-scented, its divisions acute, appearing very early.

24. ERYTHRÒNIUM, DOG-TOOTH-VIOLET. (Name from the Greek word for *red*, — not appropriate even for the original European species.) Fl. spring.

E. Dens-cànis, Dog-tooth-Violet of Eu.: sometimes cult.; has broadly oblong pale leaves little spotted, and a rose-purple or almost white flower in earliest spring.

E. Americànum, Yellow D. or Adder's-tongue. Moist or low woods, very common E.: leaves oblong-lanceolate, mottled and dotted with dark-purplish and whitish; flower light yellow.

E. álbidum, White D. Rare in N. Y. and Penn., but common W.: leaves less or not at all spotted; flower bluish-white.

25. ORNITHÓGALUM, STAR OF BETHLEHEM. (Name in Greek means *bird's-milk*, a current expression for some marvellous thing.) Fl. early summer.

O. umbellàtum, Common S. or Ten-o'clock, from Eu.: in old gardens and escaped into some low meadows: leaves long and grass-like; flowers bright white within, green outside, opening in the sun, on slender stalks.

26. ÁLLIUM, ONION, LEEK, GARLIC, &c. (Ancient Latin name.) Taste and odor *alliaceous.*

§ 1. *Wild species of the country, or one a naturalized weed.*

* *Leaves broad: flowers white, in summer: ovules and seeds single in each cell.*

A. tricóccum, WILD LEEK. Rich woods N.: bulbs clustered, large, pointed, sending up in spring 2 or 3 large lance-oblong flat leaves, and after they wither, in summer, a many-flowered umbel on a naked scape.

* * *Leaves linear, grass-like: ovules and seeds a pair in each cell: flowers rose-color, in summer.*

A. cérnuum, NODDING WILD ONION. Banks, through the Alleghany region and N. W.: scape angular, 1°–2° long, often nodding at the apex; pedicels of the loose many-flowered umbel drooping; flowers light rose-color; leaves linear, sharply keeled on the back, channelled.

A. mutábile, CHANGEABLE WILD O. Dry sandy soil S.: scape 1° high, terete, bearing an erect umbel of white flowers changing to rose-color; leaves narrow, concave; bulb coated with a fibrous network.

A. vineàle, FIELD or CROW GARLIC. A weed from Eu. in gardens and cult or waste low grounds; slender scape sheathed to the middle by the hollow thread-shaped leaves which are grooved down the upper side: flowers greenish-rose-color; often their place is occupied by bulblets.

* * * *Leaves narrow-linear, grass-like: ovules and seeds several in each cell: flowers nearly white, in spring.*

A. striàtum. Low pine barrens and prairies, Virginia to Illinois and S.: scape and leaves 6′–12′ high, the latter involute and striate on the back; flowers 3–10 in the umbel.

§ 2. *Cultivated from the Old World: flowers in summer.*

* *Leaves flat.*

A. Mòly, GOLDEN GARLIC. Cult. for ornament in some gardens: leaves broadly lanceolate; scape 1° high; flowers numerous, large, golden yellow.

A. sativum, GARDEN GARLIC. Bulbs clustered, pointed; leaves lance-linear, keeled; flowers few, purple, or bulblets in their place; filaments all broad and 3-cleft.

A. Pórrum, GARDEN LEEK. Bulb elongated, single; leaves broadly linear, keeled or folded; flowers in a head, white, with some rose-colored stripes; 3 of the filaments 3-forked.

* * *Leaves cylindrical, hollow: umbel globular, many-flowered.*

A. Ascalónicum, SCHALLOTT. Bulb with oblong offsets; leaves awl-shaped; flowers lilac-purple; 3 of the filaments 3-forked.

A. Schœnóprasum, CHIVES. Low, tufted; leaves awl-shaped, equalling the scape; flowers purple-rose-color, its divisions lanceolate and pointed, long; filament simple.

A. Cèpa, ONION. Bulb depressed, large; leaves much shorter than the hollow inflated scape; flowers white, or bulblets in their place.

27. SCÍLLA, SQUILL. (The ancient name of S. MARÍTIMA of S. Europe, the bulb of which is the officinal *squill.*)

S. Fràseri, WILD S. called WILD HYACINTH at the W., QUAMASH. Moist banks and prairies from Ohio W. & S. W.: scape and linear-keeled leaves 1° high; flowers pale blue, in a long loose raceme, in spring.

S. amœna, S. vérna, &c. are cult. from Europe in some choice collections, for their early bright blue flowers, but are rare.

28. MUSCÀRI, GRAPE or GLOBE HYACINTH. (Name from the musky scent of the flowers in one species.) All from Eu.: fl. spring.

M. botryoides, COMMON GRAPE-HYACINTH, of country gardens, escaping into lawns and fields: a pretty little plant, sending up in early spring

its narrow linear leaves, and a scape (5′–7′ high) bearing a dense raceme of globular deep blue flowers which are barely $\frac{1}{6}$′ long, resembling minute grapes, scentless.

M. racemòsum, less common in gardens, is more slender, with flaccid leaves and ovoid faintly scented flowers.

M. moschàtum, is glaucous, and has larger and ovoid-oblong livid musky-scented flowers, and linear-lanceolate shorter leaves.

M. comòsum, is larger, 9′ high, with violet-colored oblong flowers, on longer pedicels in a loose raceme, the uppermost in a tuft and abortive: the monstrous variety most cultivated produces, later in the season, from the tufted apex of the scape a large panicled mass of abortive, contorted, bright blue branchlets, of a striking and handsome appearance.

29. HYACÍNTHUS, HYACINTH. (Mythological name, the plant dedicated to the favorite of Apollo.)

H. orientàlis, Common H., of the Levant, with its raceme of blue flowers, is the parent of the numberless cultivated varieties, of divers colors, single, and double: fl. spring.

30. AGAPÁNTHUS. (Of Greek words for *amiable flower.*) One species,

A. umbellàtus. Cult. from Cape of Good Hope, a handsome house-plant, turned out blooms in summer; leaves large, bright-green, 1°–2° long; scape $1\frac{1}{2}$°–2° high, bearing an umbel of pretty large blue flowers.

31. FÚNKIA. (Named for one *Funk*, a German botanist.) Ornamental, large-leaved, hardy plants, cult. from Japan and China: fl. summer. Formerly united with the Day-Lily.

F. subcordàta. White Day-Lily, is the species with long, white, and tubular-funnel-form flowers.

F. ovàta, Blue D., the one with smaller, more nodding, blue or violet flowers, abruptly expanded above the narrow tube.

32. HEMEROCÁLLIS, DAY-LILY. (Name, in Greek, means *beauty-of-a-day*, the large flower ephemeral.) Cult. from the Old World, especially in country gardens; the first species escaped into roadsides: fl. summer.

H. fúlva, Common Day-Lily. A familiar, rather coarse and tall plant, with broadish linear leaves and tawny orange flower, the inner divisions wavy and obtuse.

H. flàva, Yellow D. Less coarse, with narrower leaves and light yellow flowers, the inner divisions acute.

33. TRÍTOMA. (Name in Greek means *thrice cut*, supposed to allude to the three sharp edges of the tapering apex of the leaves, viz. the two margins and the keel.) Flowers unpleasantly-scented, showy, in autumn.

T. Uvària, from Cape of Good Hope, planted out, is ornamental in autumn, the scape rising from the thick clumps of long grassy leaves 3° or 4° high, the cylindrical spike or raceme producing a long succession of flowers, which are at first erect and coral-red, soon they hang over and change to orange and at length to greenish yellow. Roots half hardy N.

34. YÚCCA, BEAR-GRASS, SPANISH-BAYONET. (American aboriginal name.) Wild in sandy soil S., extending into Mexico, &c. Cult. for ornament, but only the nearly stemless species is really hardy N.: fl. summer, large, and whole plant of striking appearance. Under various names and varieties, the common ones mainly belong to the following:

* *Trunk short, covered with leaves, rising only a foot or two above the ground: flowering stalk scape-like: pod dry.*

Y. filamentòsa, Common Bear-Grass, or Adam's Needle. From E. Virginia S.: leaves lanceolate, 1°–2° long, spreading, moderately rigid, tipped with a weak prickly point, the smooth edges bearing thread-like filaments; scape 3°–6° high; flowers white or pale cream-color, sometimes tinged purplish.

Y. angustifòlia, wild over the plains beyond the Mississippi, is smaller, with erect and narrow linear leaves, few threads on their white margins, and yellowish-white flowers.

* * *Trunk arborescent, 2°–8° high in wild plants on the sands of the coast S., or much higher in conservatories, naked below: no threads to the leaves.*

Y. gloriòsa. Trunk low, generally simple; leaves coriaceous, smooth-edged, slender-spiny tipped, 1°–2° long, 1′–1½′ wide; flowers white, or purplish-tinged outside, in a short-peduncled panicle.

Y. aloifòlia, Spanish-Bayonet. Trunk 4°–20° high, branching when old; leaves very rigid, strongly spiny-tipped, with very rough-serrulate saw like edges, 2° or more long, 1½′–2′ wide; the short panicle nearly sessile.

125. JUNCACEÆ, RUSH FAMILY.

Plants with the appearance and herbage of Sedges and Grasses, yet with flowers of the structure of the Lily Family, having a complete perianth of 6 parts, 3 outer and 3 inner, but greenish and glume-like. Stamens 6 or 3, style 1: stigmas 3.

1. JUNCUS. Ovary and pod 3-celled or almost 3-celled, many-seeded. Herbage smooth: stems often leafless, generally pithy.
2. LUZULA. Ovary and pod 1-celled, with 3 parietal placentæ, and one seed to each. Stems and leaves often soft-hairy.

1. JÚNCUS, RUSH, BOG-RUSH. (The classical Latin name, from the verb meaning *to join*, rushes being used for bands.) Flowers summer. — We have more than 30 species, chiefly in bogs or wet grounds, most of them difficult and little interesting to the beginner, — to be studied in the Manual and in Dr. Engelmann's monograph. The following are the commonest.

§ 1. Leafless Rushes, *with naked and jointless round stems, wholly leafless, merely with sheaths at base, in tufts from matted running rootstocks: flowers in a lateral sessile panicle.* 2

J. effùsus, Common Rush, in low grounds; has soft and pliant stems 2°–4° high, panicle of many greenish flowers, 3 stamens, and very blunt pod.

J. filifórmis, of bogs and shores only N., is slender, pliant, 1°–2° high, with few greenish flowers, 6 stamens, and a broadly ovate blunt but short-pointed pod.

J. Bálticus, of sandy shores N.; has very strong rootstocks, rigid stems 2°–3° high, a loose panicle of larger (2″ long) and chestnut-colored with greenish flowers, 6 stamens, and oblong blunt but pointed deep-brown pod.

§ 2. Grassy-leaved Rushes, *with stems bearing grass-like flat or thread-shaped (never knotty) leaves, at least near the base: panicle terminal.*

* *Flowers crowded in heads on the divisions of the panicle: stems flattened: leaves flat: stamens 3.*

J. marginàtus. Sandy wet soil, from S. New England S. & W.: 1°–3° high; leaves long linear; heads several-flowered, brownish or purplish. 2

J. rèpens. Miry banks S.: spreading or soon creeping, 4′–6′ high; leaves short linear; heads of green flowers few in a loose leafy panicle.

* * *Flowers single on the ultimate branches of the panicle, or rarely clustered: stamens 6: leaves slender.*

J. bufònius. Along all wet roadsides, &c.: stems low and slender, branching, 3′–9′ high; greenish flowers scattered in a loose panicle; sepals lance-linear and awl-pointed. ①

J. Gerárdi, Black Grass of salt marshes: in tufts, with rather rigid stems 1°–2° high, and a contracted panicle of chestnut-brown but partly greenish flowers, the sepals blunt. 2

J. ténuis. Open low grounds and fields, everywhere N.: in tufts, with wiry stems 10′–20′ high, a loose panicle shorter than the slender leaves near it, and green flowers with lanceolate very acute sepals longer than the green blunt and scarcely pointed pod. 2

J. dichótomus. Low sandy grounds, takes the place of the preceding S.: has more thread-like leaves, flowers more one-sided on the branches of the panicle, and greenish sepals only as long as the globular and beak-pointed brownish pod. 2

§ 3. KNOTTY-LEAVED RUSHES, *the stems (often branching above) having 2–4 thread-shaped or laterally flattened leaves, which are knotty as if jointed (especially when dry) by internal cross-partitions: panicle terminal. Of these there are many species, needing close discrimination: the following are only the very commonest, especially the northern ones.* 2

J. acuminàtus. Very wet places: 10′–30′ high; heads 3–10-flowered in a loose spreading panicle, greenish turning straw-colored or brownish; sepals lance-awl-shaped, barely as long as the triangular sharp-pointed pod; stamens 3; seeds merely acute at both ends. It flowers in early summer.

J. nodòsus. Mostly in sandy or gravelly soil: spreading by slender rootstocks which bear little tubers, 6′–15′ high; heads few, crowded, chestnut-brown, each of 8–20 flowers; sepals lance-linear and awl-pointed, hardly as long as the slender and taper-pointed pod; seeds abruptly short-pointed at both ends; stamens 6.

J. scirpoides. From New York S.: stems rigid, 1°–3° high from a thick rootstock; heads spherical and dense, 15–80-flowered, dull pale green; sepals rigid, awl-shaped and bristly-pointed; stamens 3; pod taper-pointed; seeds abruptly short-pointed at each end.

J. Canadénsis. Wet places, common, flowering in autumn, very variable, 1°–3° high; heads numerous, greenish or light brownish, 5–many-flowered; sepals lanceolate, the 3 outer shorter; stamens 3; seeds tail-pointed at both ends.

2. LÙZULA, WOOD-RUSH. (*Luciola* is Italian for the *glow-worm.*) 2

L. pilòsa. Shady banks N.: 6′–9′ high; with lance-linear leaves, and chestnut-brown flowers in an umbel, in spring.

L. campéstris. Dry or moist fields and woods, 6′–12′ high, with linear leaves, and 4–12 spikes or short heads of light brown or straw-colored heads in an umbel, in spring.

126. COMMELYNACEÆ, SPIDERWORT FAMILY.

Herbs with mucilaginous juice, jointed and mostly branching leafy stems, and perfect flowers, having a perianth of usually 3 green and persistent sepals, and three ephemeral petals (these commonly melt into jelly the night after expansion); 6 stamens, some of them often imperfect, and a free 2–3-celled ovary; style and stigma one. Pod 2–3-celled, few-seeded. Not aquatic, the greater part tropical.

1. COMMELYNA. Flowers blue, irregular. Sepals unequal, 2 of them sometimes united by their contiguous margins. Two of the petals rounded and on slender claws, the odd one smaller or abortive. Stamens unequal; three of them fertile, one of these bent inwards; three smaller and with cross-shaped imperfect anthers: filaments naked. Leaves abruptly contracted and sheathing at base, the uppermost forming a spathe for the flowers.
2. TRADESCANTIA. Flowers regular. Petals all alike, ovate, sessile. The 6 stamens all with similar and good anthers, on bearded filaments.

1. COMMELÝNA, DAY-FLOWER. (There were three *Commelyns,* Dutch botanists, two of them were authors, the other published nothing. In naming this genus for them, Linnæus is understood to have designated the

two former by the full-developed petals, the latter by the smaller or abortive petal.) Ours are branching perennials, or continued by rooting from the joints; in alluvial or moist shady soil: fl. all summer.

C. erécta. From Penn. S. & W.: stem erect, 2°–4° high; leaves lance-oblong, 3′–7′ long, the margins rough backwards, and sheaths fringed with bristles; spathes crowded, hooded, top-shaped in fruit; odd petal like the others but smaller.

C. Virgínica. From S. New York S. & W.: stems reclining and rooting at base; leaves oblong-lanceolate or narrower; spathes scattered, conduplicate, round-heart-shaped when laid open; odd petal inconspicuous.

2. TRADESCÁNTIA, SPIDERWORT. (Named for the gardener-botanist *Tradescant.*) Leaves sheathed at the base. ♃

* *Wild species of moist or rich woods, one very common in gardens: with erect stems, linear or lanceolate keeled leaves, the uppermost nearly like the others.*

+– *Umbels sessile at the end of the stem and branches between a pair of leaves, or later also in the lower axils: flowering in summer.*

T. Virgínica. Common wild from W. New York W. & S., and in gardens: leaves lance-linear, tapering regularly from the base to the point, ciliate; umbels terminal; flowers blue, in garden varieties purple or white.

T. pilòsa. Chiefly W.: 2° or more high, with zigzag stem, more or less pubescent leaves lanceolate from a narrowish base, very dense terminal and axillary umbels of smaller and later purple-blue flowers, and hairy calyx and pedicels.

+– +– *Umbels one or two on a naked peduncle.*

T. ròsea. Sandy woods chiefly S. & W.: slender, 6′–12′ high, smooth, with linear grass-like leaves, and rose-colored flowers ½′ wide.

* * *Conservatory species from the tropics.*

T. zebrìna, the only one common, spreads by branching and rooting freely, rarely blossoms, is cult. for its foliage; the lance-ovate or oblong rather succulent leaves crimson beneath, and green or purplish above, variegated with two broad stripes of silvery white.

127. XYRIDACEÆ, YELLOW-EYED GRASS F.

Rush-like herbs, with equitant leaves, like Sedges, or rather Bulrushes, in having flowers in a head or spike one under each firm glume-like bract, but with a regular perianth of 3 sepals and 3 colored (yellow) petals; also a 1-celled many-seeded ovary and pod with 3 parietal placentæ, somewhat as in the Rush Family, represented by

Xỳris flexuòsa, Common Yellow-eyed Grass, of sandy bogs. Scape 4′–16′ high; head roundish; lateral sepals glume-like lance-oblong, boat-shaped, wingless; the anterior one larger, membranaceous, enwrapping the corolla in the bud and deciduous with it; petals 3, with claws, alternating with 3 sterile bearded or plumose filaments and bearing on their base 3 naked filaments with linear anthers; style 3-cleft. ♃

X. Caroliniàna, the commonest of several Southern species; also N.: 1°–2° high, the scape 2-edged at top, bearing a larger head (about ½′ long), lateral sepals winged but nearly naked on the keel. ♃

X. fimbriàta, from pine barrens of New Jersey S.: 2° high, with oblong head almost 1′ long, the lateral sepals fringed on the keel. ♃

128. ERIOCAULONACEÆ, PIPEWORT FAMILY.

Another small group of marsh or aquatic herbs, of Rush-like appearance, with a head of monœcious white-bearded flowers, in structure somewhat like the Yellow-eyed Grass, terminating a naked scape, at the base of which is a tuft of grassy awl-shaped, linear, or lanceolate leaves of loose cellular texture, not equitant, but the upper surface concave.

Eriocaùlon septangulàre, in ponds or in their gravelly margins, is the common species N., with 7-angled scape 2′–6′ high, or more, when the water is deeper: fl. summer.

E. gnaphalòdes, with grassy awl-shaped taper-pointed leaves, in pine-barren swamps from N. Jersey S.

E. decangulàre, with similar or wider and blunt leaves, 10–12-ribbed scapes 1°–3° high, and heads sometimes ½′ wide; in similar situations S.

III. GLUMACEOUS DIVISION. Flowers enclosed or subtended by glumes or husk-like bracts; no proper calyx or corolla, except sometimes minute bristles or scales which represent the perianth. Stems of the straw-like sort, called *culms*.

129. CYPERACEÆ, SEDGE FAMILY.

Some rush-like, others grass-like plants, with flowers in spikes or heads, one in the axil of each glume, the glume being a scale-like or husk-like bract. No calyx nor corolla, except some vestiges in the form of bristles or occasionally scales, or a sac which imitates a perianth; the 1-celled 1-ovuled ovary in fruit an akene. Divisions of the style 2 when the akene is flattish or lenticular, or 3, when it is usually triangular. Leaves when present very commonly 3-ranked, and their sheath a closed tube; the stem not hollow. A large family, to be studied in the Manual, &c., and too difficult for the beginner. Therefore passed over here.

None cultivated, except sparingly Cypèrus esculéntus of the Mediterranean region, for its nut-like, sweet-tasted tubers, called Chufa: only two are pernicious weeds, and that from their multiplying by similar nut-like tubers, which are hard to extirpate; these are Cyperus phymatòdes, in sandy soil, but troublesome only S.; and C. rotúndus, var. Hydra, the Nut-Grass or Coco-Grass of the South. In the genus Scirpus, the tall Common Bulrush, S. lacústris, or better the small one with 3-sided stems, S. pungens, in the borders of ponds, is used for rush-bottomed chairs. Cladium effusum, with its coarse saw-edged leaves is the Saw-Grass of the South. Of Sedges proper (Carex) there are about 160 species, several of which contribute (more in bulk than value) to the hay of low coarse meadows and half-reclaimed bogs.

130. GRAMINEÆ, GRASS FAMILY.

Grasses, known from other glumaceous plants by their 2-ranked leaves having open sheaths, the jointed stems commonly, but not always hollow, and the glumes in pairs, viz. a pair to each spikelet even when it consists of a single flower (these called *glumes* proper), and a pair to each flower (called *palets*), rarely one of them wanting. Flower, when perfect, as it more commonly is, consisting of 3 stamens (rarely 1, 2, or 6), and a pistil, with 2 styles or a 2-cleft style, and 2 either hairy or plumose-branched stigmas: ovary 1-celled, 1-ovuled, becoming a grain: the floury part is the albumen of the seed, outside of which lies the embryo (Lessons, p. 25, fig. 66–70).

The real structure and arrangement of the flowers and spikelets of Grasses are much too difficult and recondite for a beginner. For their study the Manual must be used: in which the genera both of this and the Sedge Family are illustrated by plates. Here is offered merely a shorthand way of reaching the names of the commonest cultivated and meadow grasses and the cereal grains.

A. *Stems hollow, or soon becoming so.*

§ 1. *Spikelets in panicles, sometimes crowded but never so as to form a spike.*

* *Flowers monœcious, the staminate and pistillate separate in the same panicle.*

Zizánia aquática, Indian Rice or Water Oats: in water, commonest N. W.; tall and reed-like Grass, with leaves almost as large as those of Indian Corn, the upper part of the ample panicle bearing pistillate flowers on erect club-shaped pedicels, the lower bearing staminate flowers on spreading branches; each flower or spikelet with only one pair of glumes, the outer one long-awned; grain slender, ½′ long, collected for food by N. W. Indians. ①

* * *Flowers one and perfect in each spikelet, with or without rudiments of others.*

+ *Stamens* 6.

Oryza sativa, Rice. Cult. S., from Asia, in low grounds: 2°–4° high, with upper surface of the lance-linear leaves rough; branches of the panicle erect; outer glumes minute, the inner coriaceous, very much flattened laterally, so as to be strongly boat-shaped or conduplicate, closing over the grain and falling with it, the outer one commonly bearing an awn. ①

+ + *Stamens* 3, *or rarely fewer.*

Agróstis vulgàris, Red-top. Rather low and delicate grass of meadows and pastures, with oblong spreading panicle of small purple or purplish spikelets; the lanceolate proper glumes thin, but much firmer than the delicate palets, about the length of the outer one, the upper truncate palet one half shorter. 2

A. álba, Fiorin or White Bent Grass. Less abundant in meadows, the stems with procumbent or creeping base; ligule long and conspicuous; panicle more dense, greenish or slightly purplish: a valuable meadow-grass. 2

Calamagróstis Canadénsis, Blue-Joint Grass. In all bogs N., and in reclaimed low meadows, much liked by cattle: 3°–5° high; resembles an Agrostis, but taller, and with a tuft of downy long hairs around the flower almost of its length, the lower palet with a delicate awn low down on its back and scarcely stouter than the surrounding down. 2

C. arenària, Sea Sand-Reed of beaches, where it serves a useful purpose in binding the sand by its long running rootstocks; has the panicle contracted into a long spike-like inflorescence, so that it would be sought in the next division; leaves long and strong; spikelets pale, rather rigid, the hairs at the base of the palets two thirds shorter than they. 2

Phálaris arundinàcea, Reed Canary-Grass, the striped variety is the familiar Ribbon-Grass of country gardens; wild in bogs and low grounds; 2°–4° high, with flat leaves nearly ½′ wide, flowering in early summer, in a pretty dense contracted panicle, but open when the blossoms expand; the ovate whitish glumes longer and much thinner than the blunt coriaceous palets; a hairy rudiment or appendage at the base of each of the latter. 2

P. Canariénsis, Canary-Grass. Cult. from Eu. for Canary-seed, and running wild in some waste places: 1°–2° high, with the panicle contracted into a sort of oblong spike, the glumes with wing-like keels, and a little scale or rudimentary sterile flower at the base of each palet. ①

* * * *Flowers several in each spikelet, all or nearly all perfect.*

+– *Reeds or Canes of the borders of rivers and ponds.* 2

Phragmites commùnis, Common Reed, mostly N.: 5°–12° high, with leaves 1′–2′ wide, the stems dying down to the base; panicle in late summer or autumn, loose; spikelets 3–7-flowered, beset with white silky long hairs.

Arundinària macrospérma, Large Cane, forming the cane-brakes S.: with woody stems 10°–20° high and leaves 1′–2′ wide, branching the second year, at length flowering from the branches, in Feb. or March; the panicle of a few small racemes of large many-flowered naked spikelets, the palets downy.

A. técta, Smaller Reed, S., is only 4°–10° high, and more branching.

+– +– *Meadow-Grasses, &c.; with awn if any terminating the glume or palet.*

Dáctylis glomeràta, Orchard-Grass. Nat. from Europe in meadows and yards: a tall and coarse but valuable grass for hay, &c., flourishes in shady places, 3° high; with broadly linear, rather rough, pale, and keeled leaves, and a dense panicle of one-sided clusters, on which the spikelets are much crowded, each 3–4-flowered, both the glumes and the laterally compressed-keeled lower palet tapering into a short awn, rough-ciliate on the keel: fl. early summer. 2

Pòa, Meadow-Grass; several common species; known by the open panicle of 3–10-flowered spikelets, the glumes and palets blunt (no awn nor pointed tip), the latter laterally compressed and deep boat-shaped, with scarious or white membranaceous edges, and usually some delicate cobwebby hairs towards the base. Fl. summer. 2, all but the first.

Poa ánnua, Low Spear-Grass. Very low weedy grass in cult. ground, waste places, paths, &c.: fl. in spring or again in summer. ①

P. compréssa, Wire Grass. In gravelly waste soil: pale, with low very flat stems, rising obliquely from a creeping base; panicle small.

P. seròtina, Fowl-Meadow-Grass or False Red-top: an important native grass in wet meadows N.; flowers in late summer in a loose panicle, the 2–4-flowered spikelets green with dull purple; lower palet narrow, acutish.

P. triviàlis, Roughish Meadow-Grass. A common introduced meadow and pasture grass, N.: flowering before midsummer, with open panicle of green spikelets, these mostly 3-flowered, the lower palet prominently 5-nerved; sheaths and leaves roughish; ligule oblong, acute. A white-striped variety, lately introduced, is cult. for ornament and very pretty.

P. praténsis, Common M. or westward called Kentucky Blue Grass. Dry meadows and pastures, spreading by running rootstocks, and with more crowded and often purplish panicle than the foregoing, flowering in earliest summer, the sheath smooth, and ligule short and blunt; lower palet hairy along the margins and the 5 nerves.

Festùca, Fescue Grass. Known from Poa by the firmer or even coriaceous texture of the lower palet, which is convex on the back, not cobwebby, and sometimes awn-tipped.

F. ovìna, Sheep's Fescue. Valuable pasture and lawn-grass, ½°–2° high, tufted, with slender or involute pale leaves, 3–8-flowered spikelets in a short 1-sided panicle, open in flowering, contracted afterwards, the lower palet rolled up, almost awl-shaped and tipped with a sharp point or bristle-like awn. 2

F. elàtior, Taller Meadow Fescue, A rather rigid grass of meadows and pastures, nat. from Europe: 1° – 4° high, with green flat leaves, a narrow panicle with short branches appressed before and after flowering, 5 – 10-flowered green spikelets, the lower palet blunt, or acute, or rarely with a short awn. ♃

Bròmus, Brome Grass. Spikelets large, at length drooping in an open panicle, containing 5 – 10 or more flowers, the lower palet with a short bristle point or an awn from the blunt rounded tip or notch, the upper palet soon adhering to the grain. Coarse grasses: two or three wild species are common, and the following are weeds of cultivation, from Europe, or the last cultivated for fodder.

B. secálinus, Common Chess or Cheat. Too well known in wheat-fields; nearly smooth; panicle open and spreading, even in fruit; spikelets turgid; flowers laid broadly over each other in the two ranks; lower palet convex on the back, concave within, awnless or short-awned. ① ②

B. racemòsus. Upright Chess: like the other, but with narrower erect panicle contracted in fruit, lower palet slender-awned, and sheaths sometimes hairy. ① ②

B. móllis, Soft Chess: like the preceding, but soft-downy, with denser conical-ovate spikelets, and the long-awned lower palet acute. ① ②

B. unioloides, or B. Schràderi (Ceratóchloa unioloides): lately much prized for fodder, may be valuable S., is rather stout and broad-leaved, with drooping large spikelets much flattened laterally, so that the lower palets are almost conduplicate and keeled on the back. ♃

Briza máxima, Large Quaking Grass or Rattlesnake-Grass, is sometimes cult. in gardens for ornament, from Eu.: a low grass, with the hanging many-flowered ovate-heart-shaped spikelets somewhat like those of Bromus, but pointless, very tumid, purplish, becoming dry and papery, rattling in the wind, — whence the common name. ①

+ + + *Grain and Meadow-Grasses, with a mostly twisted or bent awn on the back of the lower palet: flowers* 2 *or* 3, *or few in the spikelet, and mostly shorter than the glumes.*

++ *Flowers perfect or the uppermost rudimentary.*

Avèna sativa, Cultivated Oat, from Old World: soft and smooth, with a loose panicle of large drooping spikelets, the palets investing the grain, one flower with a long twisted awn on the back, the other awnless. ①

A. nùda, Skinless Oat, rarely cult. from Old World: has narrower roughish leaves, 3 or 4 flowers in the spikelet, and grain loose in the palets. ①

++ ++ *One flower perfect and one staminate only.*

Arrenathèrum avenàceum, Oat-Grass, or Grass-of-the-Andes. Rather coarse but soft grass, introduced from Europe into meadows and fields, and rather valuable: 2° – 4° high, with flat linear leaves, long and loose panicle, thin and very unequal glumes, including a staminate flower, the lower palet, of which bears a long bent awn below its middle, above this a perfect flower with its lower palet bristle-pointed from near the tip, and above that a rudiment of a third flower. ♃

Hólcus lanàtus, Velvet-Grass, or Meadow-Soft-Grass. Introduced from Eu. into meadows, not very common, 1½° – 2° high, well distinguished by its paleness and velvety softness, being soft downy all over; panicle crowded; the flowers only 2 in the spikelet, small, rather distant, the lower one perfect and awnless, the upper staminate and with a curved or hooked awn below the tip of its lower palet. ♃

§ 2. *Spikelets either strictly spiked or in a panicle so contracted and dense as to imitate a spike.* (*Here would be sought one species of* Calamagrostis *and one of* Phalaris, *for which see above,* p. 354, 355.)

* *Awn borne low down on the back of one or two palets.*

Anthoxánthum odoràtum, Sweet-scented Vernal-Grass, nat. from Eu.: the plant which gives delicious fragrance to drying hay (the other,

viz. HIERÓCHLOA RORE\u00c0LIS, SENECA or HOLY-GRASS, being rare): low, slender, soft and smooth; the pale brown or greenish spikelets crowded in an evident spike-like panicle; each composed of a pair of thin very unequal glumes, above and within these a pair of obcordate or 2-lobed hairy empty palets, one with a bent awn from near its base, the other with a shorter awn higher up; above and within these a pair of very small smooth and roundish palets, of parchment-like texture, enclosing 2 stamens and the 2-styled pistil, finally investing the grain. ♃

Alopecùrus praténsis, MEADOW FOXTAIL. Introduced from Europe abundantly into meadows E.: flowering in spring; stem about 2° high, bearing few pale soft leaves, terminated by a cylindrical soft and dense spike, or what seems to be so, for the spikelets are really borne on short side branches, not on the main axis; these spikelets very flat contrary to the glumes, which are conduplicate, united by their edges towards the base, keeled, fringed-ciliate on the keel; these enclose a single conduplicate lower palet (the upper one wholly wanting) which bears a long awn from below the middle of the back, and surrounds 3 stamens and the pistil.

* * *Awn, if any, from the apex of the glumes or palets.*

+– *Spikelets densely crowded in a long perfectly cylindrical apparent spike, each spikelet strictly 1-flowered: glumes 2, keeled and nearly conduplicate, awn-pointed, much larger and of firmer texture than the thin and truncate awnless palets.*

Phlèum praténse, CAT-TAIL GRASS, TIMOTHY, or HERD'S GRASS; introduced from Eu.; a coarse but most valuable meadow grass, 2° – 4° high, with green roughish spike 3′ – 8′ long; the small spikelets are crowded on very short branches, and therefore the seeming spike is not a true one. ♃

+– +– *Spikelets strictly spiked all on one side of a flattened jointless rhachis, much crowded: the 2 – 5 spikes digitate, i. e. all on the apex of the flowering stem: palets awnless.* Finger-grass *might be sought here; see* Panicum *below.*

+– *Flower only one to each spikelet, and a mere rudiment beyond it, awnless.*

Cýnodon Dáctylon, BERMUDA or SCUTCH GRASS. An introduced weed chiefly S., where it is useful in sandy soil, where a better grass is not to be had; creeping extensively, the rigid creeping stems with short flattish leaves and sending up flowering shoots a few inches high, bearing the 3 – 5 slender spikes. ♃

+– +– *Flowers 3 – 5 or more in each spikelet, the uppermost generally imperfect: seed loose, proportionally large, rough-wrinkled.* ①

Eleusine Índica, CRAB-GRASS, YARD-GRASS, DOG'S-TAIL, or WIRE-GRASS. Introduced only in yards or lawns N., more abundant S., where it is valuable for cattle; low, spreading over the ground, pale; glumes and palets pointless.

Dactyloctènium Ægyptìacum, EGYPTIAN GRASS. Yards and fields, chiefly a weed, S.: creeping over the ground, low; spikes dense and thickish; glumes flattened laterally and keeled, one of them awn-pointed, the strongly keeled boat-shaped lower palet also pointed.

+– +– *Spikelets spiked alternately on opposite sides of a zigzag jointed rhachis.*

+– *Glume only one to the solitary spikelet, which stands edgewise.*

Lólium perénne, DARNEL, RYE-GRASS, or RAY GRASS. Introduced from Europe: a good pasture-grass, 1° – 2° high, with loose spike 5′ – 6′ long, of 12 or more about 7-flowered spikelets placed edgewise, so that one row of flowers is next the glume, the other next the rhachis; lower palet short-awned or awnless.

+– *Glumes a pair to the single spikelet, right and left at each joint of the rhachis.*

Tríticum répens, COUCH-GRASS, QUITCH or QUICK-GRASS, &c., belongs to the section with perennial roots; this spreads amazingly by its vigorous long running rootstocks, is a pest in cultivated fields, and is too coarse and

hard for a meadow grass: of many varieties, introduced from Europe; spikelets 4–8-flowered; lower palet either pointless or short-awned. 2

T. vulgàre, Wheat. Spike dense, somewhat 4-sided; the spikelets crowded, 4–5-flowered, turgid; glumes ventricose, blunt; palet either awned or awnless; grain free. ①

T. Spélta, Spelt. A grain rarely cult. in this country; spike flat, the rhachis fragile, breaking up at the joints; grain enclosed in the palets. ①

Secàle cereàle, Rye. Tall; spike as in wheat; spikelets with only 2 perfect flowers; glumes a little distant, bristly towards the base; lower palet ventricose, long awned; grain brown.

+ + + *Glumes* 6 *at each joint, in front of the* 3 *spikelets, forming an involucre.*

Hórdeum vulgàre, Common Barley, from the Old World: spike dense, the 3 spikelets at each joint of the rhachis all with a fertile flower, its lower palet long-awned. ①

H. dístichum, Two-rowed Barley, from Tartary: only one spikelet at each joint of the rhachis with a fertile flower, the two lateral spikelets being reduced to sterile rudiments, the flowers therefore two-rowed in the spike. ①

+ + + + *Spikelets in a contracted panicle or seeming spike, or if spiked somewhat on one side of the rhachis: each with a single perfect flower, its palets of coriaceous or cartilaginous texture: by the side of it are either one or two thin palets of a sterile usually neutral flower.*

Setària, Foxtail-Grass. Spikelets in clusters on the branches of the contracted spike-like panicle or seeming spike, these continued beyond them into awn-like rough bristles; but no awns from the spikelets themselves. Weeds, or the last one cult.; all from Old World; fl. late summer. ①

S. glaùca, Common Foxtail: in all stubble and cultivated grounds; low; spike tawny yellow, dense; long bristles 6–11 in a cluster, rough upwards (as also all the following); palets of perfect flower wrinkled crosswise.

S. víridis, Green Foxtail or Bottle-Grass; has less dense and green spike, fewer bristles, and palets of perfect flower striate lengthwise.

S. Itálica, or Germánica, Italian Millet, Bengal Grass, &c. Cult. for fodder, 3°–5° high, with rather large leaves, a compound or interrupted so-called spike, which is evidently a contracted panicle, sometimes 6′–9′ long and nodding when ripe; bristles short and few in a cluster; palets of the fertile flower smooth.

Pánicum (Digitària) sanguinàle, Finger-Grass or Crab-Grass. Chiefly a weed in cult. fields in late summer and autumn, but useful in thin grounds S. for hay; herbage reddish; spikes 4–15, slender, digitate, nearly 1-sided; spikelets seemingly 1-flowered with 3 glumes; no awns. ①

P. Crus-gálli, Cock's-foot P., or Barnyard-Grass. Common weedy grass, of moist barnyards and low rich grounds: coarse, with rather broad leaves, and numerous seeming spikes along the naked summit of the flowering stems, often forming a sort of panicle; spikelets containing one fertile and one sterile flower, the lower palet of the latter bearing a coarse rough awn. ①

P capillàre, Witch Grass of stubble and corn-fields in autumn, having a very open capillary panicle, would be sought under another division; it is a mere weed. ①

B. *Stems not hollow, pithy.*

§ 1. *Spikelets clustered or scattered in an ample panicle, each with one perfect and one neutral or staminate flower.*

* *Without silky-down: glumes, &c. russet-brown, coriaceous.*

Sórghum vulgàre, Indian Millet, Durra, or Doura, &c., from Africa or India; the var. cérnuum, Guinea Corn, has densely contracted panicle, and is cult. for the grain. Var. saccharàtum, Sweet Sorghum, Chinese Sugar-Cane, Imphee, &c., cult. for the syrup of the stem; and Broom-corn, for the well-known corn-brooms. ①

* * *Long white silky down with the flowers.*

Sáccharum officinàrum, TRUE SUGAR-CANE: cult. far S.: rarely left to flower, propagated by cuttings; stem 8°–20° high, 1′–2′ thick. 2

Gynèrium argénteum, PAMPAS GRASS. Tall reed-like grass, from S. America, planted out for ornament; with a large tuft of rigid linear and tapering recurved-spreading leaves, several feet in length; the flowering stem 6 to 12 feet high, in autumn bearing an ample silvery-silky panicle. 2

§ 2. *Spikelets in spikes: staminate and pistillate separate,*

* *In the same spike, the upper part of which is staminate, the lower pistillate.*

Trípsacum dactyloìdes, GAMA GRASS, SESAME GRASS. Wild in moist soil from Conn. S.: proposed for fodder S.; nutritious, but too coarse; leaves almost as large as those of Indian corn; spikes narrow, composed of a row of joints which break apart at maturity; the fertile cylindrical, the externally cartilaginous spikelets immersed in the rhachis, the sterile part thinner and flat. 2

* * *In different spikes.*

Zèa Màys, MAIZE, INDIAN CORN. Stem terminated by the clustered slender spikes of staminate flowers (the *tassel*) in 2-flowered spikelets; the pistillate flowers in a dense and many-rowed spike borne on a short axillary branch, two flowers within each pair of glumes, but the lower one neutral, the upper pistillate, with an extremely long style, the *silk.* ①

SERIES II.

FLOWERLESS OR CRYPTÓGAMOUS PLANTS:

THOSE which fructify without true flowers, that is, without stamens and pistils, and produce spores (simple cells) in place of seeds.

CLASS III. ÁCROGENS; the highest class of Flowerless Plants, those with a distinct axis, or stem, growing from the apex, containing woody matter and ducts, and bearing leaves, or something answering to leaves.

The account of the three following families is contributed by PROFESSOR DANIEL C. EATON, of Yale College. Figures of the indigenous genera are given in the Manual.

131. EQUISETACEÆ, HORSE-TAIL FAMILY.

Perennial flowerless plants, rising from creeping rootstocks; the stems mostly hollow, furrowed, many-jointed, with mere scales at the joints united into a sheath in place of leaves; either simple or with branches in whorls about the joints; fructification in terminal cone-like spikes, composed of 5-angled short-stalked and shield-shaped scales, each bearing on the under surface about 6 one-celled spore-cases. Contains but one genus.

1. EQUISÈTUM, HORSE-TAIL, SCOURING-RUSH. (Name from the Latin, meaning *horse-tail.*) Stems grooved, the cuticle often containing silex; each joint closed at the lower end, and bearing at the upper a tubular sheath (a whorl of united leaves) which encloses the base of the next joint, and is split into as many narrow teeth as there are ridges in the stem. Seeds (that is, *spores*) minute, each with four club-shaped threads, which are coiled about the spore when moist, but uncoil suddenly when dried. — Of 25 species, most of them widely distributed throughout the world, four or five are common with us. (Lessons, p. 157, fig. 493 – 498.)

§ 1. *Stems living through the winter, unbranched, or with very few branches, fruiting in summer.*

E. hyemàle, DUTCH RUSHES, SCOURING-RUSH. Common on wet banks, N.: stems solitary or 2 – 4 together, cylindrical, 1° – 4° high, with many rough ridges; sheaths marked with one or two black rings, and divided into 15 – 25 narrow teeth, their points deciduous.

E. scirpoìdes. Wooded hillsides, from Penn. N.: stems in dense clusters, 3′ – 6′ high, not hollowed, very slender and wiry, entangled, about 6-furrowed; sheaths 3-toothed.

§ 2. *Stems annual, not living through the winter, branched, at least the sterile ones.*

E. limòsum. Muddy edges of streams, rather common: stems all alike, 2° – 3° high, with many furrows, fruiting in summer, and afterwards sending out a few upright branches; sheaths with 15 – 20 dark-colored acute teeth.

E. arvénse, Common Horse-tail. Moist sandy places, common N.: fertile stems unbranched, with very conspicuous sheaths, 4′ – 8′ high, appearing in earliest spring and soon withering; sterile stems 8′ – 20′ high, producing many whorls of rather rigid slender and mostly simple 4-angled branches.

E. sylvàticum, Woodland H. Common N., along the edges of moist woods: fertile stems appearing in early spring, but lasting all summer, both these and the sterile ones producing many whorls of spreading or gracefully decurved compound softish 3 – 5-furrowed branches and branchlets; sheaths of the main stem loose, 8 – 14-toothed.

132. FILICES, FERN FAMILY.

Flowerless plants with creeping or ascending rootstocks, or even erect trunks, bearing distinct leaves (*fronds*), which are rolled up (*circinate*) in the bud (except in one group), and bear commonly on the under surface or on the edges the simple fructification, consisting of 1-celled spore-cases (technically called *sporangia*) variously grouped in dots, lines, or masses, and containing but one kind of minute, 1-celled, powdery, numerous *spores*. A large family, most abundant in warm and moist regions, consisting of 8 suborders, 6 of which are represented with us.

[*The divisions of a pinnatifid frond are properly called segments; of a pinnate frond, pinnæ; of a 2 – 3 – 4-pinnate frond, pinnules or ultimate segments. The stalk of the frond is a stipe; its continuation through the frond, the rhachis; its branches, partial or secondary rhachises. A rhachis bordered by the leafy portion becomes a midrib, which may be primary, secondary, &c.*]

I. POLYPODIACEÆ, or TRUE FERNS: characterized by stalked spore-cases, having a vertical, incomplete, many-jointed, elastic ring, which straightens at maturity, breaking open the spore-case transversely, and so discharging the spores. Spore-cases rarely if ever on very narrow thread-like branches; the fruit-dots often covered by a scale-like involucre (the *indusium*).

§ 1. *No definite fruit-dots, but the spore-cases in large patches on the under surface of the fertile frond, or entirely covering the under surface: no indusium.*

1. ACROSTICHUM § CHRYSODIUM. Fronds simple or pinnately branched, with reticulated veins: spore-cases covering the whole under surface of the frond or of its upper divisions.
2. PLATYCERIUM. Fronds irregularly forking; veins reticulated: spore-cases in large patches on special portions of the under surface.

§ 2. *Spore-cases on the back of the frond, sometimes near the margin, in dots or lines (sori) placed on the veins or at the ends of the veins, but without indusium of any kind.*

3. POLYPODIUM. Fronds simple or pinnate, rarely twice pinnate; veins free or reticulated; fruit-dots round or roundish, at the ends of the veins, or at the point where several veins meet (*anastomose*). Stalk articulated to the rootstock, and leaving a distinct scar when decayed away.

14. PHEGOPTERIS. Agrees with Polypodium in most respects; but has the fruit-dots smaller, and commonly on the veins, not at their ends, and the stalk is not articulated to the rhachis.

4. GYMNOGRAMME § CEROPTERIS. Fronds compound, covered beneath with white or yellow waxy powder: fruit-dots in long often forking lines on the veins.

5. NOTHOLÆNA. Fronds once or twice pinnate, woolly, scaly or powdery beneath; fruit-dots at the ends of the veins, forming a line next the margin of the divisions.

§ 3. *Spore-cases on the back along the margin of the frond, provided with an involucre formed of its reflexed and more or less altered margin.*

6. ADIANTUM. Fruit-dots at the ends of the veins, borne on the inner side of a reflexed portion of the margin. Stalk dark and polished, sometimes chaffy-bristly. Pinnules always separate, distinctly stalked or almost sessile, but never decurrent on the rhachis.

7. PTERIS. Spore-cases on a transverse veinlike receptacle within the margin, which connects the ends of the veins, and is covered by the reflexed thin margin. Stalk light-colored (except in § Doryopteris.) Pinnules or ultimate segments adnate to the rhachis, often decurrent.

8. PELLÆA. Spore-cases in short lines on the upper part of the veins, confluent in a sub-marginal band of fructification, white within, more or less covered by the reflexed and commonly thin margin. Stalk dark and polished, sometimes chaffy. Pinnules mostly distinct, sessile or nearly so.

§ 4. *Fruit-dots oblong or linear, on transverse reticulating veinlets, in rows near the midrib and parallel to it: indusium of the same shape as the fruit-dot, opening toward the midrib and attached by the outer edge to the fruitful cross-veinlet.*

9. WOODWARDIA. Fruit-dots straight, oblong-linear, in chain-like rows, partly sunken in shallow cavities of the under surface of the frond. Rather large, native. Veins reticulated, often very much so.

10. DOODIA. Fruit-dots oblong, often slightly crescent-shaped, not sunken in the frond. Exotics; the narrow fronds pinnatifid or simply pinnate.

§ 5. *Fruit-dots oblong or linear, on one or both sides of oblique veinlets, with involucres of like shape attached by one edge to the veinlet and free along the other.*

11. ASPLENIUM. Fruit-dots single and placed on the upper side of the veinlets, rarely double and set back to back on both sides of the same veinlet. Veins mostly free.

12. SCOLOPENDRIUM. Fruit-dots linear, elongated, double and placed face to face along contiguous veinlets; each pair thus seeming to be a single one with an indusium opening along the middle. Frond simple, ribbon-shaped or tongue-shaped, with free forking veins.

13. CAMPTOSORUS. Fruit-dots various, mostly short; those near the midrib double as in the last; the outer ones angled, curved or straight, simple as in Asplenium. Frond simple, tapering to a long and narrow usually rooting point. Veins reticulated.

§ 6. *Fruit-dots on the back of the veins, rarely at the ends, round or roundish, covered at least when young by a special indusium of the same general shape. Sterile and fertile fronds alike or nearly so.*

15. ASPIDIUM. Indusium flat, round or kidney-shaped, fixed at or near the centre, opening all round the edge. Mostly rather large Ferns, from once to thrice pinnate. Veins free in the native species.

16. CYSTOPTERIS. Indusium convex, fixed by the base partly under the fruit-dot, at length reflexed. Small Ferns, with delicate twice or thrice pinnate fronds. Veins free.

§ *Sterile fronds broad and leafy: fertile ones with contracted and rolled up and pod-like or berry-like divisions: indusium very obscure, irregularly semicircular, placed at the base of a short receptacle to which the spore-cases are attached.*

17. STRUTHIOPTERIS. Sterile fronds tall, with free veins, growing in a crown; fertile fronds coming up much later in an inner circle, pinnate, each pinna rolled up from the edges into a somewhat cylindrical or necklace-like body, containing the fruit.

18. ONOCLEA. Fronds scattered on a long creeping rootstock; sterile ones with reticulated veins; fertile ones twice pinnate, the divisions contracted, rolled up and berry-like.

§ 8. *Involucres star-shaped, with broad and ragged or else capillary and jointed rays, placed on the veins under the round fruit-dots, sometimes at first enveloping the spore-cases.*

19. WOODSIA. Small Ferns, often growing in dense tufts: fronds once or twice-pinnate: veins forked, free.

§ 9. *Fruit-dots separate or laterally confluent at or near the margin of the frond, borne on the ends of the veins, or on the ends of very short side-veinlets: the indusium attached at the base or base and sides, and opening toward the margin of the fruitful portion of the frond.*

20. DAVALLIA. Indusium of a single piece, flattish or often convex and shaped like half a goblet cut lengthwise. Exotic Ferns, mostly decompound.
21. DICKSONIA. Indusium united by its sides with a little lobe or tooth of the frond, forming a minute 2-lipped cup, at first nearly or quite closed, opening as the spore-cases ripen. Large Ferns, native or exotic, some of the latter arborescent.

II. CYATHEACEÆ, or TREE FERNS: with erect and tree-like stems, often many feet high. Fruit-dots round, not marginal, naked, or with an involucre placed beneath the stalked spore-cases, which are seated on a globose or elevated receptacle, have a somewhat oblique complete ring, and burst open transversely.

22. CYATHEA. Fruit-dots on a vein or in the forking of a vein, at first enclosed in a globose involucre, which opens at the top, and remains cup-shaped with an entire or broken edge.
23. ALSOPHILA. Fruit-dots as on the last, but entirely naked, or with a rudimentary indusium consisting of a minute scale beneath the spore-cases: veins free.

III. HYMENOPHYLLACEÆ, or FILMY FERNS: these have very delicate and translucent fronds, the short-pedicelled spore-cases growing on a short or long thread-like receptacle, included in a goblet-shaped or 2-lipped involucre, and furnished with a complete transverse or slightly oblique ring.

24. TRICHOMANES. Fruit-dots marginal, at the end of a vein, which extends through the funnel-form or goblet-shaped involucre, as a thread-like receptacle bearing the spore-cases; involucres sunken more or less in the frond, and of the same pellucid texture.

IV. SCHIZÆACEÆ: mostly small Ferns, or else with climbing fronds. Spore-cases ovate, sessile, having a complete transverse, articulated ring or cap at the apex, and opening by a longitudinal slit.

* *Ferns with elegant climbing fronds, rising from slender creeping rootstocks: spore-cases fixed by their side.*

25. LYGODIUM. Pinnæ or frondlets in pairs. Spore-cases covered by imbricating scale-like indusia in a double row on narrow lobes of the frond.

* * *Not climbing: rootstock short: fronds clustered: spore-cases fixed by their base: no indusium.*

26. ANEIMIA. Spore-cases on the narrow panicled branches of the lowest pair of pinnæ of the 1–3 pinnate frond, or on separate fronds.
27. SCHIZÆA. Spore-cases in a double row on the narrow divisions of a pinnate or rarely pedate special appendage to the simple and linear, or fan-shaped, and sometimes many-forked frond.

V. OSMUNDACEÆ, or FLOWERING FERNS: rather large Ferns; the spore-cases covered with reticulated ridges, opening longitudinally into two valves, and with no ring, or a mere vestige of a transverse ring at the back.

28. OSMUNDA. Rootstock very thick, creeping, the growing end producing a crown of tall showy fronds. Fertile fronds or parts of fronds contracted, pinnately compound, the narrow often thread-like divisions densely covered with nearly sessile spore-cases.

VI. OPHIOGLOSSACEÆ, the ADDER'S-TONGUE FAMILY: mostly rather small ferns, with sessile, globular, coriaceous opaque and smooth spore-cases, opening transversely into 2 valves, and wholly destitute of a ring. Fronds not rolled up in the bud, as they are in all the foregoing, rising from a very short rootstock or corm, with fleshy roots.

29. BOTRYCHIUM. Spore-cases in pinnate or compound spikes, distinct. Sterile part of the frond compound; veins free.
30. OPHIOGLOSSUM. Spore-cases cohering in a simple spike. Sterile part of frond simple in our species; the veins reticulated.

1. ACRÓSTICHUM § CHRYSÒDIUM. (From Greek words meaning *a row at the top,* the application not evident.) All tropical.

A. aùreum. A large evergreen Fern, along the coast of South Florida; the fronds simply pinnate, coriaceous; pinnæ 4′ – 6′ long, 1′ – 2′ wide, elliptical or oblong-linear.

2. PLATYCÈRIUM, STAG-HORN FERN. (Name from the Greek, meaning *broad horns.*) Natives of Africa, Australia, &c.: cult. in conservatories.

P. alcicórne. Sterile fronds sessile, rather thin, flat and rounded, overlapping each other; fertile ones erect, 1° high, whitish and minutely downy beneath, 2 – 3 times forked, with divisions about 1′ wide, the topmost ones fruitful.

3. POLYPÒDIUM, POLYPODY. (Name in Greek means *many-footed,* referring to the branching rootstock.) An immense genus, found in all parts of the world.

§ 1. POLYPODIUM proper. *Veins free: the following all native.*

P. vulgàre, COMMON POLYPODY. Rocky places N., small, simply pinnatifid, evergreen, smooth both sides, 4′ – 10′ high, 1′ – 3′ wide, the numerous divisions oblong-linear; fruit-dots rather large. (Lessons, p. 157, fig. 499.)

P. incànum. Shady places S., often on trees; much like the last, but much smaller, and beneath grayish and scurfy with peltate scales; fruit-dots rather small.

§ 2. CAMPYLONEÙRON. *Veins parallel, pinnate from the midrib, connected by numerous transverse angularly arched veinlets, with short fruit-bearing veinlets proceeding from the angles.*

P. Phyllítidis, HARTS-TONGUE, of Tropical America; frond simple, linear-lanceolate, 1° – 1½° long, 1′ – 2′ wide, thinly chartaceous, smooth and shining; fruit-dots in 2 rows between the veins.

§ 3. NIPHÓBOLUS. *Veins much as in the preceding, but very obscure and closely reticulated. Fronds simple, of a thickish texture, covered on both sides with a close stellate down.*

P. Língua. Cult. from Japan: fronds 4′ – 8′ long, ovate-oblong or lanceolate, entire, at length nearly smooth above; fruit-dots exceedingly numerous, closely arranged in many rows.

§ 4. PHLEBÒDIUM. *Veins reticulated, with free veinlets included in the larger meshes. Fruit-dots in* 1 – 3 *rows between the midrib and margin, commonly placed each one on the converging ends of a pair of veinlets.*

P. aùreum. A large showy Fern of Florida, and cult. from West Indies; fronds on a stout stalk, broadly ovate in outline, smooth, pale green above, glaucous beneath, pinnately parted into 5 – 9 or more oblong-linear or lanceolate spreading divisions.

4. GYMNOGRÁMME. (Name meaning in Greek a *naked line*, from the elongated fruit-dots.) The following cult. species all have free veins, and the under surface of the fronds covered with a yellow or whitish waxy powder.

G. triangulàris, CALIFORNIAN GOLD-FERN. Deserves more general cultivation; frond 4′–6′ long, on slender and polished stalks, broadly 3- or rather 5-angled in outline, twice pinnate below, pinnate above; pinnæ oblong-lanceolate, deeply pinnatifid into obtuse lobes. Smooth and green above, beneath of a rich golden yellow, sometimes paler; the fertile fronds at length nearly covered with brownish lines of spore-cases.

G. sulphùrea, of West Indies: fronds narrowly lanceolate in outline, 1°–1½° high, 2′–3′ wide, pinnate; pinnæ ovate or ovate-oblong, lower ones gradually smaller and very remote, pinnatifid into ovate obtuse toothed or ragged lobes, the lower surface covered with sulphur-yellow powder.

G. calomélanos, from Tropical America, the commonest Gold and Silver ferns of the conservatories; much like the last, but broader and larger, the lower pinnæ largest, and lobes mostly acute. The powder white, or in var. CHRYSOPHÝLLA golden yellow.

5. NOTHOLÆ̀NA. (Name from the Greek, signifying *spurious wool*, the woolly pubescence of some species concealing the marginal fruit-dots.) The following cult. species are small, 4′–8′ high, ovate in outline, mostly tripinnate; their ultimate divisions roundish-ovate or oblong, distinct, stalked, and covered beneath with a waxy powder: stalk and branches dark brown and polished.

N. flàvens, from Central America: powder bright yellow; fruit-dots extending from the edge almost to the midrib, so that it might equally well be considered a Gymnogramme.

N. nívea. Also Central American, and very like the other; but the powder snowy white, and the fruit-dots closer to the margin.

6. ADIÁNTUM, MAIDEN-HAIR. (Name from the Greek, meaning *unwetted*, the rain-drops not adhering to the fronds.) A large genus, most abundant in warm climates.

* *Frond simply pinnate: exotic.*

A. macrophýllum. Cult. in hot-houses from West Indies; pinnæ 2–5 pairs and a terminal one, nearly sessile, deltoid-ovate, 2′–3′ long, nearly half as wide; fructification in long marginal rarely interrupted lines. Pinnæ of sterile fronds wider and somewhat crenately incised and toothed.

* * *Frond 2–4 times pinnate, ovate-lanceolate in general outline.*

A. Capíllus-Véneris, VENUS-HAIR, so named from the shining capillary branches of the rhachis; native S., often in conservatories N.: twice pinnate or thrice pinnate at the base, the long upper part simply pinnate; pinnules about ½′ broad, on very slender stalks, sharply wedge-shaped at the base, rounded at the top, or rhomboidal, commonly deeply lobed from the upper margin; fruit-dots one to each lobe; involucres kidney-shaped or transversely oblong. Plant 6′–12′ high, often pendent from damp shaded rocks in the mouths of wells, &c., in S. of Europe.

A. Æthiópicum, as commonly seen in hot-houses, is much like the last, but has smaller pinnules not so sharply wedge-shaped, often broader than long, and less deeply lobed; fruit-dots in deep sinuses of the upper margin; involucres kidney-shaped or crescent-shaped.

A. cuneàtum, from S. America, is a much larger plant, broadly triangular in outline, 3–4 times pinnate; pinnules smaller and very numerous, wedge-shaped at the base, the upper edge deeply lobed; fruit-dots as in the last.

* * * *Frond two-forked, with elongated simply pinnate divisions springing from the upper side of the two recurved branches: midrib of the pinnules none: veins forked from the base.*

A. pedàtum, MAIDEN-HAIR. Native in shady woods; whole plant smooth, 1°–2° high; principal divisions 4′–10′ long, 1′–1½′ wide; pinnules very

numerous oblong, broadest at the base, obtuse, lobed from the upper edge; fruit-dots at the top of the lobes; involucres transversely oblong or linear.

A. hispídulum, from Australia, &c.: commonly less symmetrical than the last, when young irregularly 3–4-branched; a smaller plant with finely chaffy or bristly stalk and rhachis; pinnules minutely hairy, nearly entire; fruit-dots crowded along the upper margin, involucres rounded kidney-shaped.

7. PTÈRIS, BRAKE. (The ancient Greek name for Ferns, meaning *a wing*, from the feather-like fronds.) Another large and widely distributed genus.

§ 1. *Veins free: stalk straw-colored or brownish.*

* *Frond simply pinnate: pinnæ undivided.*

P. longifòlia. Cult. from warm regions, native in S. Florida: oblong-lanceolate in outline; pinnæ numerous, linear and tapering from a truncate or cordate base, the upper and lower ones gradually smaller.

* * *Frond pinnate, and with the lower pairs of pinnæ forked or again pinnate, the divisions and upper pinnæ elongated, simple.*

P. Crètica. Cult. from warm climates, native in Florida: 1°–2° high; pinnæ 1–4 pairs, the upper ones slightly decurrent, lower ones cleft almost to the base into 2–3 long linear-lanceolate acuminate divisions; sterile ones and tips of the narrower fertile ones finely and sharply serrate. Var. ALBO-LINEATA has a whitish stripe in the middle of each division.

P. serrulàta. Cult. from China: 1°–1½° high; pinnæ 3–8 pairs, all but the lowest decurrent and forming a wing 3″ wide on the main rhachis; lower pairs pinnately or pedately cut into several narrow linear-acuminate divisions; upper ones simple, sterile ones spinulose-serrulate.

* * * *Fronds pinnate, and the numerous primary divisions pinnately cut into many lobes, the lowest ones mostly with* 1–3 *elongated similarly-lobed branches on the lower side.*

P. quadriaurìta. Cult. from East or West Indies, &c.: fronds 1°–3° long, 6′–12′ wide, broadly ovate in outline; lobes of primary divisions linear-oblong, ½′–1′ long, 3″ wide, very numerous and often crowded, mostly rather obtuse. Var. ARGÝREA, has a band of white along the middle of the primary divisions; to this is added a tinge of red in var. TRÍCOLOR.

* * * * *Fronds broadly triangular, twice or thrice pinnate throughout: lowest primary divisions long-stalked.*

P. aquilìna, COMMON BRAKE. Plentiful everywhere, 1°–5° high, harsh to the touch; the lowest primary divisions standing obliquely forward; secondary divisions pinnatifid with many oblong or linear sometimes hastate lobes, which in a fruiting frond are bordered everywhere with brown spore-cases.

§ 2. DORYÓPTERIS. *Veins finely reticulated: frond pedate, and 5-angled: stalk black and shining.*

P. pedàta. Cult. from West Indies and S. America: frond 2′–6′ long and nearly as wide, almost parted into a few primary divisions; upper ones entire, lowest pair again cleft; the lobes on the lower side much largest.

8. PELLÆA, CLIFF-BRAKE. (Name from the Greek, meaning *dark-colored*, descriptive of the stalk.) Mostly small Ferns: the following species have fronds of a somewhat coriaceous texture.

P. rotundifòlia, from New Zealand: frond narrow, 6′–12′ long, on a chaffy and pubescent wiry stalk, simply pinnate; pinnæ round or roundish-oblong and entire; band of spore-cases very wide and concealing the narrow involucre.

P. atropurpùrea. Wild, on shaded limerock: fronds tufted, 6′–12′ long, 2′–4′ wide, with polished and sparingly downy stalks, 2-pinnate, simply pinnate toward the top; pinnules distinct, oblong or linear-oblong, rarely halberd-shaped, obtuse or slightly mucronate; involucre rather broad, and at length hidden by the spore-cases.

P. hastàta, from South Africa: mostly larger than the last and very variable; frond ovate-lanceolate or oblong, 1–3-pinnate; pinnules lanceolate or

rhomboid-ovate, very often halberd-shaped, the end ones of the primary pinnæ much the largest, often 1′–2′ long and ½′–1′ broad; stalk and branches black and polished, smooth; involucre rather narrow.

9. WOODWÁRDIA, CHAIN-FERN. (Named in honor of *Thomas J. Woodward,* an English botanist of the last century.) A small genus of rather large Ferns, all natives of the N. temperate zone.

W. Virgínica. Tall, growing in swamps N. & S.: sterile and fertile fronds alike, ovate in outline, pinnate, with lanceolate deeply pinnatifid pinnæ; lobes oblong, obtuse; veins reticulated, forming a single row of meshes along the midribs of pinnæ and of lobes, the outer veinlets free; fruit-dots oblong, close to the midribs.

W. angustifòlia. Range, &c. of the last, but less common: fronds 6′–10′ long, 4′–6′ broad, pinnatifid almost to the winged rhachis into 17–27 lobes, which are broadly lanceolate and with copiously reticulated veins in the sterile frond, but are narrowly linear in the fertile, and with a single row of narrow meshes next the midrib; fruit-dots linear, sausage-shaped, one in each mesh.

10. DOÒDIA. (Named in honor of *Samuel Doody,* an early English Cryptogamic botanist.) Small Ferns, cult. from Australia and New Zealand.

D. caudàta. Fronds 9′–15′ long, linear-lanceolate, on dull-black nearly smooth stalks, pinnate with many linear serrate and nearly sessile pinnæ, which are about 1′ long, often slightly auriculate at base, the lower ones rather triangular, distant; fruit-dots in a single row next the midrib.

D. áspera. Stalk black and rough with small ragged points; fronds broadly lanceolate, rather coriaceous, harsh to the touch, pinnatifid to the rhachis; divisions crowded, oblong-linear, spinulose-serrate, lower ones gradually smaller: fruit-dots not close to the midrib, sometimes a second row next the margin.

11. ASPLÈNIUM, SPLEENWORT. (Name from the Greek; refers to supposed action on the spleen.) A very large genus, the size of the species ranging from quite small up to very large and even tree-like.

§ 1. *Fronds undivided, large and showy: cult. from East Indies, &c.*

A. Nìdus, Bird's-nest Fern. Fronds numerous, broadly lanceolate, 2°–4° long, 4′–8′ wide, entire, short-stalked, arranged in a crown around the central upright rootstock; fruit-dots very narrow, elongated, crowded, running from the stout midrib obliquely half-way to the margin.

§ 2. *Fronds small, pinnatifid below, tapering into a long entire point: native.*

A. pinnatífidum. Very rare, near Philadelphia, and sparingly W. & S., especially along the Alleghanies: fronds 3′–6′ long, ½″–1¼′ wide at the base; lobes roundish-ovate mostly obtuse; fruit-dots small, irregular.

§ 3. *Fronds simply pinnate.*

* *Small Ferns, 4′–15′ high: all except the last are wild species.*

A. Trichómanes. Common, forming dense tufts in crevices of shady rocks: fronds linear, 4′–8′ long, with black and shining stalk and rhachis, and many roundish or oblong slightly crenated or entire pinnæ, about ¼′ long and about half as broad; fruit-dots few to each pinna.

A. ebèneum. Common in rocky woods: fronds linear-lanceolate, narrower at the base, 8′–15′ long, 1′–2′ wide; stalk dark and polished; pinnæ many, linear-oblong, often slightly curved, finely serrate, auricled on one or both sides at the base; fruit-dots numerous.

A. flabellifòlium. Cult. from Australia: lax, the rhachis often prolonged and rooting at the very end; fronds linear; pinnæ sharply wedge-shaped at the base, the broad and rounded end crenated; fruit-dots irregularly radiating from the base of the pinnæ.

* * *Large Ferns, 1°–3° high.*

A. angustifòlium. Rich woods N., and S., mainly along the mountains: fronds thin, long-lanceolate, pinnæ many 3′–4′ long, linear-lanceolate from a

truncate or rounded base, acuminate, nearly entire; those of the fertile frond narrower; fruit-dots slightly curved, very numerous.

§ 4. *Fronds more than once pinnate.*

* *Fruit-dots more than one in each smallest division of the frond.*

A. Rùta-murària, WALL-RUE. On exposed cliffs of limestone, from Vermont W. & S.: fronds small, 1′–4′ long, ovate, twice or thrice pinnate, the few divisions rather thickish, wedge-shaped or rhomboid, toothed at the top; fruit-dots few, becoming confluent.

A. furcàtum. Cult. from Trop. America, S. Africa, &c.: fronds 8′–15′ long, 3′–6′ wide, on a somewhat hairy stalk, ovate-lanceolate, pinnate with lance-oblong acuminate pinnæ, which are again pinnately cut nearly or quite to the midrib; divisions oblique, wedge-shaped, narrow, serrate, rather coriaceous, deeply marked by the forking veins; fruit-dots elongated, radiating from the base of the division.

A. thelypteroides. In rich rocky woods, not rare: fronds 1½°–3° high, thin in texture, broadly lanceolate, pinnate; pinnæ 3′–6′ long, lanceolate, deeply pinnatifid into close-set oblong and obtuse minutely toothed lobes; fruit-dots 6–12 to each lobe, some of them commonly double.

A. Filix-fœmina, LADY-FERN. Common in moist woods: fronds large (2°–3° high, 4′–8′ broad), growing like the last in a crown, 2–3-pinnate; pinnæ lanceolate, with a narrow border to the secondary rhachis: pinnules oblong and sharply serrate, or in larger plants lanceolate and pinnatifid with incised lobes; fruit-dots short, variously curved, at length confluent.

* * *Smallest divisions of the frond narrow, entire, containing but a single veinlet and but one fruit-dot.*

A. Belángeri. Cult. from Malacca and Java: fronds 1°–1½° high, 2′–3′ wide, coriaceous, pale green, as is the stoutish stalk; pinnæ oblong, truncate at the base, with a rounded apex, pinnatifid to the winged midrib into numerous narrowly oblong and obtuse lobes, the upper basal ones of each pinna 2–3-cleft, the rest entire and bearing on the side farthest from the main rhachis a solitary elongated fruit-dot.

A. myriophýllum. Limestone caves in Jackson Co., Florida: fronds delicate, almost translucent, lanceolate, 6′–9′ long, 1′–2′ wide, 2–3-pinnate; smallest divisions obovate-oblong, 2″–3″ long, ½″ wide; fruit-dot in the lower half of each division.

A. bulbíferum. Cult. from New Zealand, &c: fronds herbaceous, ample, broadly lanceolate, 1°–3° long, 6′–12′ wide, 2–3-pinnate, often producing leafy bulbs on the upper surface; pinnæ triangular-lanceolate, with a broadly winged midrib; pinnules lanceolate, deeply toothed or cut into oblong-linear lobes; fruit-dots extending from the middle of the lobes downward almost to the midrib of the pinnules.

12. SCOLOPÉNDRIUM. (Name from the Greek word for a *centipede*, suggested by the many oblique lines of fruit each side of the midrib.)

S. vulgàre, HART'S-TONGUE. Rare, among shaded rocks in Central New York and in Canada West; fronds 6′–18′ long, 1′–2′ wide, oblong-lanceolate from a heart-shaped base, herbaceous, the margin entire or wavy. Cultivated forms from England are crisped, crested, many-forked, &c.

13. CAMPTOSÒRUS, WALKING-LEAF. (Name from the Greek, meaning a *bent heap*, referring to the curved and angled fruit-dots.) Almost the only species is

C. rhizophýllus. Damp mossy rocks N. & S., mainly along the mountains: frond 4′–12′ long, tapering from a heart-shaped or auricled base 6″–12″ wide to a long narrow point, which often roots at the end, and there gives rise to a new plant, ready to take another step in advance. (Lessons, fig. 501.)

14. PHEGÓPTERIS, BEECH-FERN (which the name means in Greek, the original species often found among beeches). Chiefly tropical; but the following are all wild species, in rocky or shady woods.

* *Fronds twice pinnatifid: the sessile pinnæ mostly forming an irregular and many-angled wing along the rhachis.*

P. polypodioìdes, formerly Polypódium Phegòpteris. Common N.: fronds 4′–9′ long, longer than broad, triangular-ovate, slightly hairy beneath; pinnæ lanceolate, the lower pair turned obliquely forwards; secondary divisions crowded, oblong, obtuse, entire; fruit-dots all near the margin.

P. hexagonóptera. Common N. & S.: larger than the last, which it much resembles, but the frond is broader than long; lowest pinnæ much the largest and with elongated and pinnatifid divisions; fruit-dots not exclusively near the margin.

* * *Fronds with three primary divisions, which are stalked, rhachis wingless.*

P. Dryópteris. Common N.: fronds broadly triangular, 4′–6′ wide, smooth; the three primary divisions triangular, once or twice pinnate with oblong obtuse entire or toothed lobes; fruit-dots near the margin.

15. ASPÍDIUM, SHIELD-FERN. (Greek for a *little shield*, referring to the indusium.) — A very large genus, inhabiting all parts of the world.

§ 1. Nephròdium or Dryópteris. *Indusium round-kidney-shaped or nearly circular with a narrow cleft from the lower side almost to the centre.*

* *Fronds thickish, simply pinnate, the few pinnæ entire or nearly so.*

A. Siebòldii. Cult. from Japan: fronds coriaceous, smooth, about 1° high, with 2–4 pairs of side pinnæ, each 4′–6′ long and nearly 1′ wide, and a terminal one rather larger than the others; veins with 4–6 free parallel branches; fruit-dots large, scattered in several rows.

* * *Fronds thin, decaying in early autumn (or tender hot-house plants), pinnate: pinnæ simply pinnatifid with mostly entire obtuse lobes: indusium small.*

+– *Rootstock creeping, slender, nearly naked and bearing scattered fronds: veins free, simple or once forked: wild species, common in bogs and low grounds.*

A. Thelýpteris. Fronds lanceolate, 10′–18′ long, on slender stalks, nearly smooth; pinnæ lanceolate, 2′–4′ long, about ½′ wide, spreading or turned down, the lowest pair scarcely shorter; divisions oblong, fruiting ones seeming acute from the revolute margins; veins mostly forked; fruit-dots confluent when ripe; indusium smooth.

A. Noveboracénse. Much like the last, but hairy beneath along the rhachis and veins; fronds tapering both ways from the middle; lower pinnæ gradually smaller and distant; lobes flat, the basal ones often larger and incised; veins rarely forked; fruit-dots distinct; indusium slightly glandular.

+– +– *Rootstock oblique or erect, stouter, bearing the fronds in a crown: veins simple, free, or the lower ones of contiguous lobes united: indusium hairy.*

A. pàtens. Low shady grounds, Florida and W.: fronds 1°–2° high, sparsely pubescent, ovate-oblong; pinnæ 3′–6′ long, ½′ wide, numerous, lanceolate from a broad base, lowest pairs a little smaller; divisions oblong, slightly falcate, obtuse or acutish; veins entirely free; indusium slightly hairy.

A. mólle. Cult. from tropical countries: very much like the last, but everywhere downy or soft-hairy; pinnæ less deeply lobed; lobes obtuse; lower veinlets (1 or 2 pairs) uniting with the corresponding ones of contiguous lobes and sending out a ray-like veinlet to the sinus; indusium very hairy.

* * * *Fronds smooth, from once to thrice pinnate, growing in a crown from a stout and chaffy rootstock, and often remaining green through the winter: veins 2–4-forked or branching. Wild species of the country.*

+– *Fronds imperfectly evergreen, once pinnate with deeply pinnatifid pinnæ, or nearly twice pinnate: fruit-dots not close to the margin: indusium rather large, flat, smooth, persistent.*

A. Goldiànum. Rich moist woods N.: fronds broadly ovate, 2°–4° high, 9′–12′ wide; pinnæ oblong-lanceolate, broadest about the middle, parted to the

midrib; divisions very numerons, nearly 1′ long, somewhat scythe-shaped, rather acute, serrate with incurved teeth; fruit-dots very near the midvein.

A. cristàtum. Wet places in woods, common: fronds narrowly oblong, 1°–2° high, 3′–5′ wide, rather rigid, erect; pinnæ triangular-ovate, broadest at base, pinnatifid almost to the midrib, divisions not many, oblong, obtuse, finely serrate, the largest ones sometimes toothed or pinnatifid-lobed; fruit-dots half-way between midvein and margin. — Var. CLINTONIÀNUM, in swampy woods, N., is very much larger every way, with fruit-dots nearer the midvein, and is often mistaken for A. Goldianum. — Var. FLORIDÀNUM, in wet woods S., has the lower pinnæ triangular-lanceolate and sterile, but the upper ones fertile, narrower and longer, with very short obtuse rather distant divisions, which are decurrent on the winged secondary rhachis.

+– +– *Fronds imperfectly evergreen, twice or thrice pinnate: the divisions cut-toothed or incised: fruit-dots not near the margin: indusium rather small, withering away.*

A. spinulòsum. Shady woods, very common N.: fronds thin, oblong-ovate; pinnæ oblong-lanceolate, the lower ones broader and somewhat triangular; pinnules very numerous, oblong-ovate, pinnately incised, the oblong lobes with spinulose teeth toward the ends; indusium smooth or minutely glandular at the margin. — Has several forms. —Var. DILATÀTUM, in mountainous places, N., is larger, broader in outline and commonly but twice pinnate; pinnules of the lowest pinnæ greatly elongated. —Var. BOÓTTII, in swampy woods N., is 2°–3° high, of narrow outline, barely twice pinnate, with oblong-ovate toothed pinnules, or the lower ones pinnatifid: — it runs apparently into A. cristatum.

+– +– +– *Fronds fully evergreen, thickish, about twice-pinnate: fruit-dots near the margin: indusium thickish, convex, persistent.*

A. marginàle. Rocky woods, common N.: fronds 1°–2° long, ovate-oblong, bluish-green, the stalk very chaffy; pinnæ lanceolate, 3′–5′ long; pinnules oblong, often curved, entire or obtusely toothed, attached by a broad base to the narrowly winged secondary rhachis; fruit-dots close to the margin, rather large.

§ 2. POLÝSTICHUM. *Indusium orbicular, peltate, attached by the centre to a short stalk: veins forking, free: wild species of the country.*

A. acrostichoides. Rocky woods, common; fronds 1°–2° high, growing in crowns, with chaffy rootstocks and stalks, evergreen, shining, lanceolate, simply pinnate; pinnæ numerous, oblong-lanceolate from an unequal half-halberd-shaped base, serrulate with bristle-pointed teeth, rarely incised, upper ones of the fertile frond smaller and bearing copious soon confluent fruit-dots.

§ 3. CYRTÒMIUM. *Indusium as in* § POLYSTICHUM. *Fronds once pinnate: veins pinnate from the midrib, pinnately branching, the veinlets reticulated and forming arched meshes with* 1–3 *free included veinlets rising from the base of the arch: exotic.*

A. falcàtum. Cult. from Japan: fronds 1°–2° high, 5′–9′ broad; base of stalk chaffy with large scales; pinnæ thick and shining, end one large and rhomboid or halberd-shaped; side ones few or many, oblong-ovate, long-pointed, nearly entire, lower side of base rounded, upper side angled or slightly auricled; fruit-dots in many rows on all or nearly all the pinnæ.

16. CYSTÓPTERIS. (Greek for *Bladder Fern*, alluding to the thin, sometimes inflated indusium.) Species few, mostly Northern.

C. frágilis. Shaded or moist rocky places, common N.: fronds very delicate, 4′–8′ long, with slender stalks, oblong-ovate, twice-pinnate; pinnæ with a narrowly margined rhachis; pinnules oblong or ovate, toothed or incised, very variable; indusium pointed at the upper end.

C. bulbífera. Wet places, oftenest in ravines, from N. Carolina N.: fronds 1°–3° high, 3′–5′ wide at the base, narrowed above and much elongated, twice pinnate, bearing scattered bulblets beneath; pinnules oblong, obtuse, toothed or pinnatifid; indusium roundish, truncate on the upper side.

17. STRUTHIÓPTERIS, OSTRICH-FERN (which the name means in Greek, from the large plume-like sterile fronds).

S. Germànica. Alluvial grounds, N.: sterile fronds tall, 2° – 5° high, lanceolate, narrowed at the base into a short angular stalk, pinnate; pinnæ very many, narrowly lanceolate, pinnatifid more than half-way to the midrib; lobes numerous, oblong; fertile fronds very much shorter, blackish, standing erect after the others have withered.

18. ONOCLÈA. SENSITIVE-FERN. (Name, from the Greek, meaning a *closed vessel*, referring to the berry-like fructification.) The only species is

O. sensíbilis. Common in wet places: sterile fronds of all sizes up to 2° high, broadly triangular-ovate, the rhachis winged; pinnæ not many, lanceolate, entire or obtusely lobed less than half-way to the midrib, veins everywhere reticulated; fertile fronds with few closely appressed pinnæ.

19. WOÓDSIA. (For *Joseph Woods*, an English botanist.)

W. obtùsa. Rocky places, from Carolina N.: fronds 6′ – 18′ high, slightly glandular, broadly lanceolate, pinnate with ovate or oblong deeply pinnatifid or again pinnate divisions; lobes oblong, obtuse; indusium at first closed, opening into a few ragged lobes.

W. Ilvénsis. Exposed rocks, common N., and along the Alleghanies: forms large tufts; fronds 4′ – 8′ high, rusty chaffy beneath, oblong-lanceolate, pinnate; divisions ovate, obtusely lobed; indusium obscure, consisting of a few jointed hairs.

20. DAVÁLLIA. (Named for *M. Davall*, a Swiss botanist.) Many tropical or sub-tropical species, the following cult. in conservatories.

D. Canariénsis, HARE'S-FOOT-FERN, from the Canary Islands, etc.: rootstock creeping above ground, covered with brownish scales, and looking not unlike an animal's paw; fronds few, smooth, broadly triangular, 8′ – 15′ long and about as wide, 3 – 4-pinnate; pinnules cut into a few narrow lobes; these are directed upwards, bearing at or just below the end a single fruit-dot; indusium whitish, deeply half-cup-shaped.

D. tenuifòlia, from India and China: rootstock creeping, crisp with short chaffy hairs; fronds smooth, 1° – 2° high, broadly lanceolate, 3 – 4-pinnate; smallest divisions narrowly wedge-shaped, bearing at the truncated ends one or two fruit-dots; indusium brownish, mostly broader than deep.

21. DICKSÒNIA. (For *James Dickson*, an English botanist.) The species all but one tropical or in the southern hemisphere.

D. punctilóbula. Moist shady places, from N. Carolina N.: rootstock creeping, slender; fronds scattered, thin, minutely glandular, pleasantly odorous, lancelote, long-pointed, 2° – 3° high, mostly bipinnate; pinnules pinnatifid; the divisions toothed, each bearing a minute fruit-dot at the upper margin; indusium globular.

D. antárctica. Tree-fern from New Zealand, a great ornament in large conservatories: trunk 3′ – 5′ thick, sometimes many feet high, bearing in a crown at the top many fronds, 6° – 9° long, 2° – 4° broad, coriaceous, twice pinnate; pinnules oblong, acute, pinnatifid; the oblong-ovate divisions bearing 1 – 4 rather large fruit-dots; indusium prominent, plainly two-valved.

22. CYÁTHEA. (Name from the Greek word for a *small cup*, referring to the involucre.) Tree-ferns from tropical countries.

C. arborea. Rarely cult. from W. Indies: trunk sometimes 20° high, stalk mostly light-brown, and without prickles or chaff; fronds 4° – 10° long, bipinnate; pinnæ 1° – 2° long, 6′ – 8′ wide, lanceolate; pinnules narrowly lanceolate, spreading, pinnatifid to the midrib; lobes oblong, slightly serrate, with 4 – 9 fruit-dots near the midvein; involucre beautifully cup-shaped, the margin entire. — Several other species, as well as one or two of the allied genus HEMITELIA (with an imperfect involucre, veins often partly reticulated), are rarely seen in conservatories.

23. ALSÓPHILA. (From Greek words meaning *grove-loving*, the species growing in tropical forests.

A. áspera. Rarely cult. from W. Indies: trunk 6° – 8° high; stalks prickly, clothed at the base with pale, narrow scales; fronds 6° – 8° long, 2° – 3° wide, bipinnate; rhachis hairy above; pinnæ oblong-lanceolate; pinnules very many, lanceolate, pinnatifid almost to the midrib; lobes oblong, curved, serrate, obtuse; fruit-dots 8 – 10 to a lobe; indusium a thin scale on one side of the fruit-dot, often disappearing with age.

A. pruinàta, from S. America, is sometimes seen; a much smaller plant; rootstock short, clothed with bright-brown wool; fronds smooth, green above, pale and glaucous often almost white beneath, bipinnate; pinnules deeply toothed; fruit-dots solitary at the base of each tooth; spore-cases mixed with woolly hairs.

24. TRICHÓMANES. (An ancient Greek name of some Fern, referring to the hair-like stalks.) A large genus; most of the species tropical.

T. radìcans. On dripping rocks, Alabama and Tennessee, very rare: fronds pellucid, 4′ – 8′ high, the stalk and rhachis narrowly winged, lanceolate, pinnate with 1 – 2-pinnatifid ovate pinnæ; involucres on short lobes, funnel-shaped, with long exserted receptacles. — A broader and more compound form from Killarney, Ireland, is grown in Wardian cases.

25. LYGÒDIUM, CLIMBING-FERN. (Name from a Greek word meaning *flexible*, alluding to the twining and climbing fronds.) Not many species; all but ours tropical.

L. palmàtum. Low shady woods, rather rare: smooth, slender, and delicate, 2° – 4° high, entangled among herbs; pinnæ roundish, 12″ – 18″ wide, deeply heart-shaped at the base, palmately 5 – 7-lobed, upper ones decompound and fertile.

L. Japónicum. Conservatory plant from Japan: climbing 10° – 12° high, smooth; pinnæ ovate, 5′ – 9′ long, bipinnate, divisions ovate-lanceolate, often halberd-shaped; divisions of the upper pinnæ bordered with narrow fertile lobes.

26. ANEÌMIA. (Name from the Greek, meaning *without covering*, alluding to the naked spore-cases.) Mainly tropical.

A. Phyllítidis. Cult. from S. America: 12′ – 18′ high, has the two lower pinnæ long-stalked, narrowly-elongated, 3 – 4-pinnate, fertile; middle portion of the frond sterile, simply pinnate; pinnæ lanceolate, finely serrate; veins reticulated.

A. adiantoìdes. Native in Key West, Florida; with lower pinnæ as in the last; middle portion sterile, 2 – 3-pinnate; pinnæ long-pointed; divisions obovate-wedge-shaped, entire or toothed at the end, with free veins forking from the base.

27. SCHIZÆA. (Name from the Greek verb which means *to split*, referring to the many-forked fronds of certain tropical species.)

S. pusílla. Wet sand, in pine woods of New Jersey: sterile fronds very slender, flattened, simple and linear, curled up; fertile ones similar, but straight, 2′ – 3′ high, bearing at the top the fertile portion, 2″ – 3″ long, composed of about 5 pairs of minute pinnæ. (Lessons, p. 158, fig. 505 – 507.)

28. OSMÚNDA, FLOWERING FERN. (Name of doubtful origin, anciently "*Osmund the Waterman*," who was perhaps St. Osmund, Bishop of Salisbury, or possibly St. Christopher, patron of watermen. *Vide Hooker's British Ferns.*) Species very few, fruiting in spring or early summer.

* *Fruiting fronds distinct from the leafy ones.*

O. cinnamòmea, CINNAMON-FERN. Swamps, abundant everywhere: sterile fronds 2° – 5° high, broadly lanceolate, pinnate with many lanceolate deeply pinnatifid pinnæ; fertile ones much shorter, at first woolly, soon withering; fructification bright cinnamon color.

* * *Fructification borne at the top or middle of an otherwise leafy frond.*

O. Claytoniàna. Wet places, common: sterile fronds much like those of the last, but more obtuse at the top; fertile ones with 2 – 4 pairs of contracted and fertile blackisk pinnæ just below the middle, — otherwise like the sterile

O. regàlis, ROYAL FERN. Also common in swamps and wet woods, fruiting later than the others: fronds truly bipinnate; pinnules oval or oblong, serrulate, obtuse, sometimes a little heart-shaped at base, or slightly auricled on one side; fertile portion at the top of the frond, panicled; spore-cases light-brown.

29. BOTRYCHIUM, MOONWORT. (Name from the Greek word for a *bunch of grapes,* from the appearance of the fructification.) Species very few, none cultivated.

B. ternàtum. Shaded grassy pastures and hillsides: plant fleshy, 3′ – 10′ high; common stalk with two branches, a long-stalked fertile one with twice or thrice pinnate fructification facing a triangular ternately compound sterile portion on a longer or shorter stalk. — Has several forms: var. LUNARIOÌDES has roundish kidney-shaped sterile divisions; in var. OBLÌQUUM they are lanceolate from an oblique base; and in var. DISSÉCTUM, pinnatifid into narrowly toothed and ragged lobes.

B. Virgínicum. In rich woods: plant herbaceous, not fleshy, 6′ – 18′ high; sterile portion sessile on the common stalk, thin, broadly triangular, ternate; the parts twice or thrice pinnate; divisions thin, oblong-lanceolate, incised or toothed; fertile portion long-stalked, twice or thrice pinnate. — Other smaller species occur rarely N.

30. OPHIOGLÓSSUM. (Greek equivalent of the common name.)

O. vulgàtum, ADDER'S-TONGUE. Wet meadows or hillside pastures, rare: 3′ – 10′ high; sterile portion somewhat fleshy, ovate or elliptical, entire, 1′ – 2′ long, sessile near the middle of the stalk which supports the short two sided spike. — Some rare tropical species have large and palmate, or pendulous and ribbon-like fronds. (Lessons, p. 158, fig. 508.)

134. LYCOPODIACEÆ, CLUB-MOSS FAMILY.

Flowerless plants, often moss-like or fern-like, with leafy, often elongated and branching stems, the spores contained in rather large solitary spore-cases borne in the axils of the simple mostly awl-shaped leaves. (Lessons, p. 160, fig. 511 – 515.)

§ 1. *Growing on land: stems more or less elongated and branching: leaves mostly less than 1′ long, often minute: spore-cases in the axils of the upper (often transformed and imbricated) scale-like leaves.*

1. LYCOPODIUM. Mostly evergreen plants; the leaves awl-shaped, in 4 or more rows; the 2-valved kidney-shaped spore-cases all of one kind, containing only minute numberless spores.
2. SELAGINELLA. But one species evergreen N.; leaves mostly flattened, rarely awl-shaped, mostly in 4 rows, two rows being of smaller leaves; spore-cases of 2 kinds; one 2-valved and filled with minute spores, the other 3 – 4-valved and containing very few large spores.

§ 2. *Growing in water or mud: stems very short and corm-like: leaves rush-like, elongated, with large spore-cases adhering to the upper surface of their dilated bases, and as if imbedded in them.*

3. ISOETES. Outer spore-cases with large reticulated spores; inner ones with minute powdery spores.

1. LYCOPÒDIUM, CLUB-MOSS. (Name from the Greek, meaning *wolf's-foot,* probably from the short hairy branches of *L. clavatum.*) Species about 100, in all parts of the world: the following all wild species.

§ 1. *Fructification not in a distinct spike. Leaves all alike, dark-green, rigid, in about 8 rows.*

L. lucídulum. Damp woods N.: stems 4′ – 8′ long, tufted, ascending, forking; leaves spreading or reflexed, sharp-pointed, irregularly serrulate, dark green and shining.

§ 2. *Fructification spiked at the top of an erect branch: fertile leaves and those of the creeping stems nearly alike, soft, narrowly linear, many-rowed.*

L. alopecuroides. Pine-barren swamps, New Jersey & S.: scarcely evergreen: stem and sparingly forked sterile branches creeping, fertile ones 6′ – 18′ high, all rather stout and thickly clothed with spreading soft linear-awl-shaped bristly-ciliate leaves, those of the spike with long slender tips.

§ 3. *Fructification spiked: the fruiting leaves yellowish, scale-like, shorter and broader than those of the sterile branches.*

* *Spike sessile at the top of an ordinary branch.*

L. annótinum. Cold woods N.: stem creeping, 1° – 4° long; branches 4′ – 9′ high, nearly erect, once or twice forked; leaves about 5-rowed, spreading or reflexed, rigid, lanceolate, acute, nearly entire; those of the solitary spikes ovate, with spreading points and ragged scarious margins.

L. dendroídeum, Ground-Pine. Moist woods, common N.: rootstock creeping, under-ground, nearly leafless; stems looking much like a miniature hemlock, 9′ – 12′ high; the many spreading branches with shining lanceolate entire leaves in about six rows; leaves of the lower and often of the upper row smaller than the rest; spikes single, or 4 – 10 on a plant; scales ovate pointed, margin slightly scarious, nearly entire.

* * *Spikes raised above the ordinary branches on a slender stalk which has only a few inconspicuous leaves*

+– *Stems creeping, very short: spikes always single.*

L. Carolinianum. Wet pine-barrens, New Jersey and S.: scarcely evergreen; stem and prostrate branches rooting underneath; leaves soft, lanceolate, entire, spreading horizontally, with an upper appressed row; spikes slender on stalks 4′ – 6′ high. — Allied in habit to L. alopecuroides.

+– +– *Stems extensively creeping: spikes often in pairs or fours.*

L. clavàtum, Club-moss. Common N. in dry woods: running stem long and leafy; branches mostly erect, cordlike, irregularly pinnate; branchlets 4 – 10, thickly covered with linear-awl-shaped entire commonly bristle-tipped leaves; spikes mostly in pairs.

L. complanàtum. Dry woods, commonest among evergreens: running stems with scattered awl-shaped very small leaves; branches erect, several times branched: the parts repeatedly forked into many horizontally spreading flattened branchlets.

2. SELAGINÉLLA. (Name a diminutive of *Selago*, a species of Lycopodium.) Species over 200, the greater part tropical.

§ 1. *Native species.*

S. rupéstris. Exposed rocks: a common moss-like little evergreen; stems and densely tufted branches 1′ – 2′ high; leaves awl-shaped, marked with a narrow furrow on the back, and tipped with a minute bristly point; spikes four-cornered.

S. ápus. Damp places in meadows; common, especially S.: very delicate; stems 2′ – 4′ high, sparingly branched; leaves 4-rowed, those of the side rows spreading horizontally, scarcely 1″ long, ovate with the upper side larger, minutely serrulate; intermediate ones half as large, erect, very acute; spikes 2″ – 6″ long. — Often cult. as *S. densa.*

§ 2. *Cultivated, mostly tropical species, seen in conservatories: much branched: leaves of the branches four-rowed, two side rows of spreading leaves set apparently edgewise, and two upper rows of smaller appressed leaves. Spike four-cornered, at the ends of the branchlets.*

* *Stems trailing, sending out rootlets nearly up to the end.*

+– *Branchlets only 1″ broad: leaves wide apart in each row.*

S. delicatíssima. Stems 4′ – 8′ long, irregularly forked and branched; branches rather distant; leaves oblong-roundish, obtuse, with a few slender cilia towards the base; intermediate ones ovate, pointed.

+– +– *Branchlets 2″ – 3″ broad, their leaves closely placed in each row.*

S. Kraussiàna. (LYCOPODIUM DENTICULÀTUM of the florists.) Stems very long, articulated below each branch; branches distant, bearing a few short forked branchlets; leaves bright green, the larger ones oblong-ovate, acute, rounded on the upper side, nearly straight on the lower, minutely denticulate; smaller ones with longer often reflexed points.

S. uncinàta. (LYC. CÆSIUM of florists.) Stems very long, not articulated, freely branched; branches 2 – 3-pinnate with short crowded branchlets; leaves when living with a steel-blue iridescence, fading to green when dried, very closely placed, larger ones oblong, equal-sided, obtuse, entire; smaller ones ovate with slender incurved points.

* * *Stems ascending, only the lower part bearing long rootlets.*

S. Marténsii. (LYC. STOLONÍFERUM of florists.) Stems 6′ – 10′ long, much branched from the base; branches bipinnate, with copious branchlets 2″ – 3″ or even 4″ wide; larger leaves crowded, obliquely ovate, the upper side broadest, obtuse, entire; smaller ones ovate with a slender often recurved point.

* * * *Stems erect, or nearly so, rooting only at the very base.*

S. erýthropus. Stalk 2′ – 6′ high, bright red, having a few closely appressed red leaves, and bearing at the top a broad frond-like stem pinnately or pedately divided into a few 2 – 3 times pinnate branches, with very numerous extremely crowded branchlets 1″ – 1½″ wide; leaves closely imbricated, obliquely ovate-oblong, curved upward, rather obtuse, ciliate; smaller ones ovate, with long straight points.

S. Braúnii. (LYC. WILLDENÒVII of florists.) Stalk straw-color or pale red, shorter than in the last, finely pubescent, as are the branches; frond-like stems long-ovate, 4 times pinnate, resembling an elegant fern; branchlets not crowded, about 1″ wide; leaves scarcely imbricated, ovate, obtuse, entire; smaller ones with straight points.

* * * * *Stems in a dense nest-like tuft, not rooting: branches often curling up when dry.*

S. cuspidàta. (LYC. CIRCINÀLE of florists.) Frond-like stems 6′ – 8′ long, green above, paler beneath, oblong or lyre-shaped, loosely 3-pinnate; branchlets 1″ wide; leaves obliquely triangular-ovate, with long often incurved bristle-points, having a narrow whitish margin, sparingly ciliated and minutely denticulate; smaller ones obliquely ovate, with long slender points.

S. lepidophýlla, from Lower California, &c., is the "Bird's-Nest Moss," or "Resurrection-Plant." It is a nest-like ball when dry, but when moist it unfolds and displays the densely 2 – 3-pinnate elegant fern-like branches radiating from a coiled-up central stem; the leaves white-margined, closely imbricated, round-ovate, obtuse. — Nearly 30 species are cultivated in Great Britain, besides those here described.

3. ISÒETES, QUILLWORT. (Name from the Greek words for *equal* and *year*, meaning that the plant is the same at all seasons.) The species demand too nice discrimination for the beginner, and must be studied by aid of the Manual. (Lessons, p. 160, fig. 516 – 519.)

I. lacústris, rather rare only N., and the far commoner

I. echinóspora, are the principal northern species, living under water.

I. ripària and **I. Engelmánni,** with leaves 4′ – 20′ long, live partly out of water, at least for a part of the summer.

I. melanópoda, only W., lives in shallow ponds or pools which dry up in summer.

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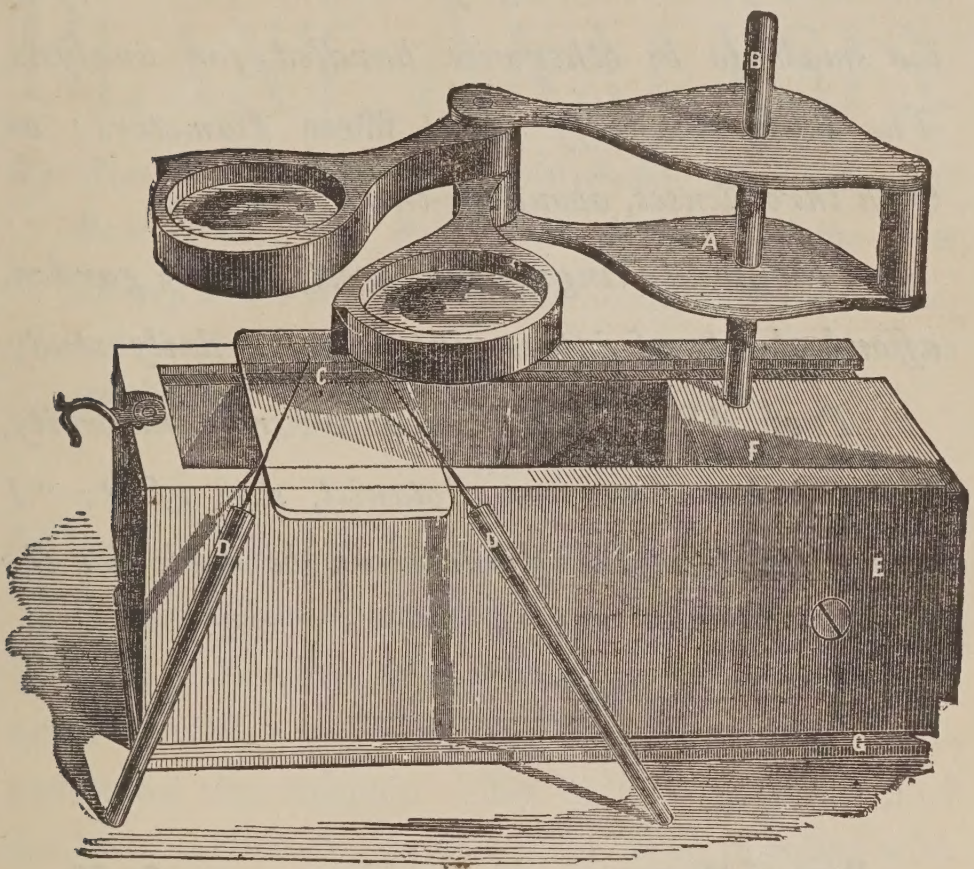

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